

LAPHAM'S

QUARTERLY

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SUMMER 2018



WATER





LAPHAM'S
Q U A R T E R L Y

*Thousands have lived without love, not one
without water.*

—*W.H. Auden, 1957*

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LAPHAM'S

QUARTERLY

WATER

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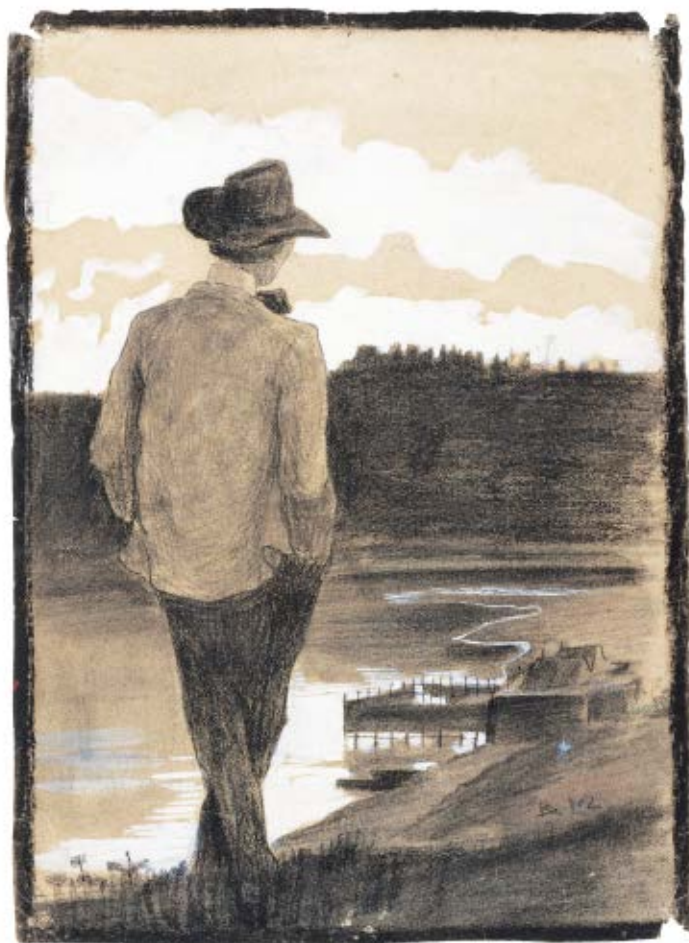


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Young Man on a Riverbank, by Umberto Boccioni, 1902.

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Many of the passages in this issue have been abbreviated without the use of ellipses; some punctuation has been modified, and while misspellings have been corrected, archaic grammar and word usage mostly remains unchanged. The words are faithful to the original texts.

Among the Contributors



Before winning two National Book Awards, **Jesmyn Ward** (1977–) once read before an audience of three people in a San Francisco bookstore. “I wondered whether I was on the right path,” she admitted, “since it seemed that no one cared about these characters I loved so deeply, that no one gave a shit about their stories.”



After he abandoned his medical practice in Basel, the German alchemist and physician **Paracelsus** (1493–1541) traveled extensively, supposedly staying in Moscow with Grand Duke Vasily III. While there, he was captured by a group of invading Tatars, who took him to Constantinople.



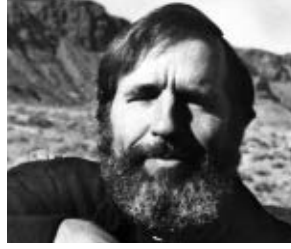
Maghrebi explorer **Ibn Battuta** (1304–c. 1369) traveled in 1332 to Astrakhan, on the Volga River, in the dead of winter. “I was unable to mount a horse because of the quantity of clothes I had on,” he wrote, “so that my associates had to help me into the saddle.”



Poet **Joseph Brodsky** (1940–1996) first went to the University of Michigan in 1972. Sixteen years later he gave the winter commencement address in Ann Arbor. “No matter how abominable your condition may be,” he told two thousand graduates, “try not to blame anything or anybody.”



In 1753, Scottish novelist **Tobias Smollett** (1721–1771) was arrested for caning a man who owed him money. Charged with attempted murder and brought before the Court of King’s Bench, Smollett was found guilty of assault for “no more than a simple blow given to a rascal.”



Having run out of money while attending the University of New Mexico, **Edward Abbey** (1927–1989) returned to his native Pennsylvania to work in a General Electric refrigerator factory in Erie. He referred to his time there as “six pointless months in hell.”



When **Joan Didion** (1934–) was an editor for *Vogue*, a writer once failed to deliver an assigned piece on self-respect. Writing on deadline and to an exact character count, Didion composed her own essay, “On Self-Respect,” for the August 1961 issue.



As a boy, **Lucian** (c. 120–c. 180) demonstrated a talent for making wax models. He was therefore apprenticed to his uncle, a sculptor. The two quarreled—he claimed his uncle beat him with a stick. Lucian ran away, eventually becoming a traveling lecturer and satirist.



The anthropologist **James Frazer** (1854–1941) first encountered a member of a remote tribe when he was just a small boy. A nursemaid took him to a fairground in Glasgow where the Wild Man of Borneo, dashing from his tent, sent Frazer fleeing in terror.



In 1975 philosopher **Michel Foucault** (1926–1984) taught a seminar at the University of California. After a lecture, Foucault went with friends to Death Valley, where they dropped acid and listened to Richard Strauss' *Four Last Songs*. "He wrote us a few months later that it was the greatest experience of his life," said one of the friends.



Scholastique Mukasonga (1956–) has lived in France since 1992. After twelve years there, she returned briefly to Rwanda, where her parents and all but one of her siblings had been killed in the 1994 genocide. Her family's enclosure was overgrown, and her Hutu neighbors maintained that no one had ever lived on that land.



Rachel Carson (1907–1964) serialized what would become her best-known book, *Silent Spring*, in *The New Yorker* in 1962. For exposing the dangers of pesticides, she became an enemy of the American chemical industry, which accused her of engaging in "emotionalism." Ten years later the U.S. government banned the domestic use of DDT.



Dutch microscopist **Antonie van Leeuwenhoek** (1632–1723) discovered spermatozoa in 1677. He believed a tiny homunculus was curled up inside the head of the sperm cell, and that each embryo contained even smaller embryos ad infinitum.



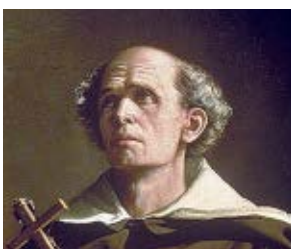
A.R. Ammons (1926–2001) began writing poetry while on board a navy ship in the South Pacific. After the Second World War, he worked in sales at his father-in-law's glass company in New Jersey. "No contemporary poet in America," wrote Harold Bloom, "is likelier to become a classic than A.R. Ammons."



Novelist **Elias Khoury** (1948–) was born in Beirut. In 1993 he asked an editor for *The Beirut Review*, "Do you know who is responsible for censorship here? The Ministry of the Interior. Any policeman can come and censor Shakespeare."



The Canadian poet **Anne Carson** (1950–) says her earliest memory is of a dream. "I dreamed I was asleep in an upper room, came downstairs, and stood in the living room," she said. "Inside its usual appearance, the living room was as changed as if it had gone mad."



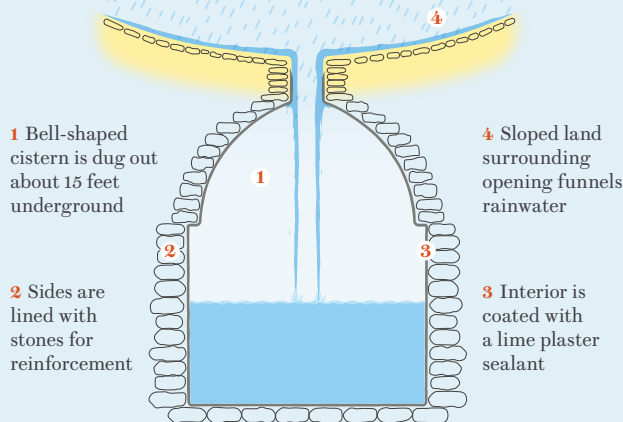
In 1514, when **Bartolomé de Las Casas** (c. 1484–1566) was reading Ecclesiasticus in Hispaniola, he came to the conclusion that the Spanish conquest of the New World and slavery were wrong. He renounced his land and slaves and returned to Spain to ask Charles V to end the abuses.



In 1823, while serving as French minister of foreign affairs, the writer **François-René de Chateaubriand** (1768–1848) convinced Louis XVIII to dispatch a large army—known as the Hundred Thousand Sons of Saint Louis—across the Pyrenees to restore the absolute Bourbon monarchy in Spain.

Aqueous Solutions

Pulling water out of thin air, bedrock, and astronauts' bladders



CHULTUN

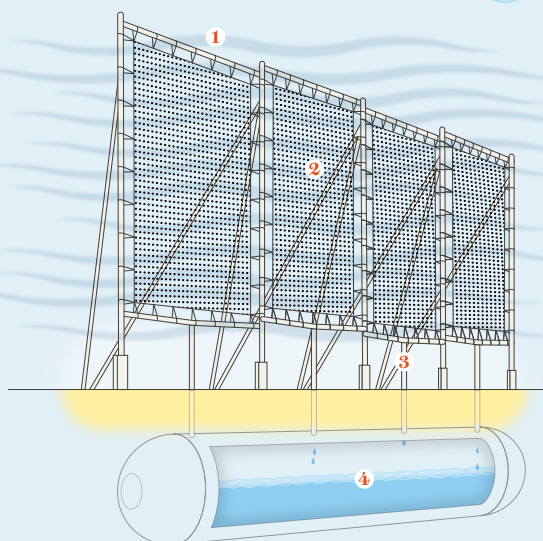
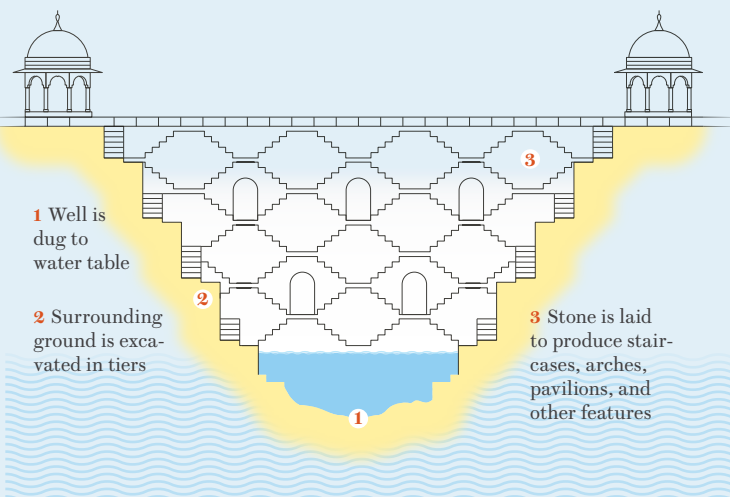
Origin: Yucatán, c. 300 BC

Many Mayan settlements drew water from cenotes, natural wells or reservoirs formed by limestone sinkholes. Where no cenotes existed, the Mayans built chultuns, which could hold up to 400 gallons of water. The opening was often sealed with a stone cover; many chultuns have been noticed by archaeologists only because tree roots have pushed the covers out of place.

STEPWELL

Origin: Gujarat & Rajasthan, India, c. 300

Northwestern India's deep water table and arid climate called for wells that extended several stories belowground and were wide enough to collect abundant rainwater during monsoon season; built-in staircases allowed access to water, even when levels fluctuated. Over the centuries they became ever-more elaborate showcases of Hindu and Islamic architecture. Although nearly all have fallen into disuse, the region's current water crises have brought renewed interest in the structures.



FOG HARVESTER

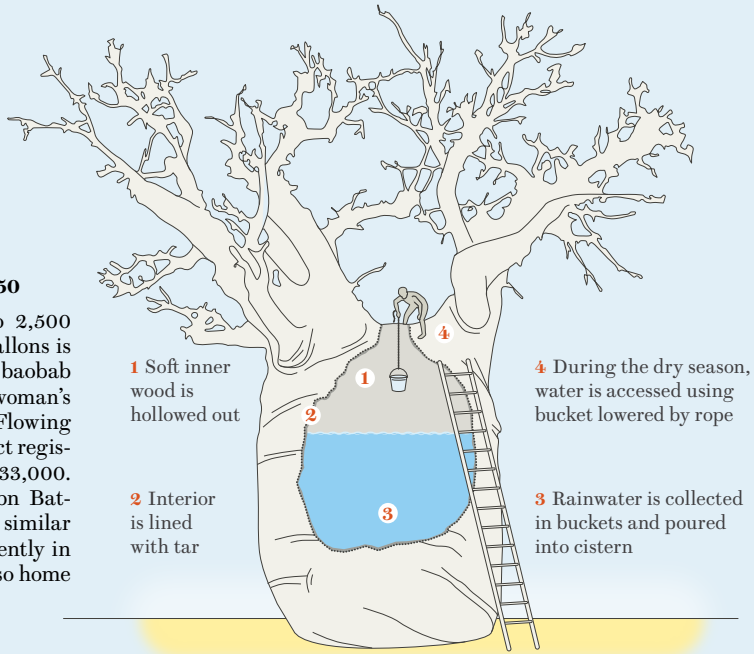
Origin: Chile, 1980s

Useful in areas with regular fog and wind but little rainfall, the technology was developed in the Chilean highlands. The fullest implementation has been on the southern slopes of the Atlas Mountains in Morocco, where 500 residents rely on them as their primary water source. On particularly foggy days, each panel can trap up to 250 gallons of drinking water.

BAOBAB CISTERN

Origin: Sahara Desert, c. 1350

A large tree can hold up to 2,500 gallons of water; about 500 gallons is more typical. In Sudan, each baobab cistern is traditionally given a woman's name, such as Umm Aisha (Flowing Mother), and enrolled in district registers; a 1924 observer counted 33,000. First described by traveler Ibn Battuta in the fourteenth century, similar practices developed independently in Madagascar and Australia, also home to baobabs.

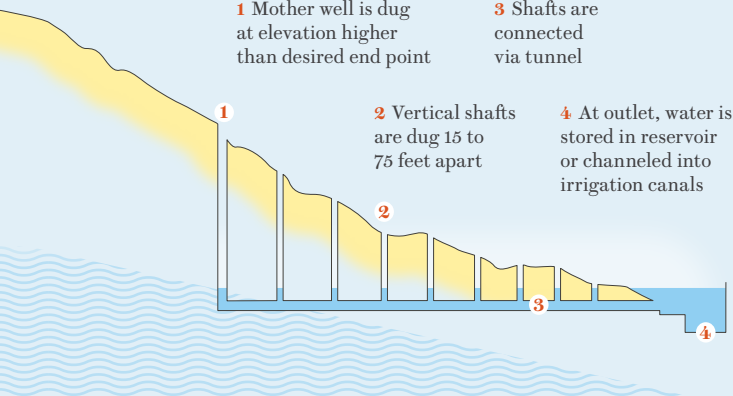


1 Soft inner wood is hollowed out

2 Interior is lined with tar

4 During the dry season, water is accessed using bucket lowered by rope

3 Rainwater is collected in buckets and poured into cistern



1 Mother well is dug at elevation higher than desired end point

2 Vertical shafts are dug 15 to 75 feet apart

3 Shafts are connected via tunnel

4 At outlet, water is stored in reservoir or channeled into irrigation canals

QANAT

Origin: Persia, c. 650 BC

Eventually spreading eastward to Afghanistan and as far west as Egypt, these underground aqueducts could occasionally extend more than forty miles in length. In addition, the frigid temperatures of qanat channels were used to develop passive air-conditioning systems. Until Tehran's water supply system was modernized in the 1950s, its population relied on a centuries-old network of qanats.

WATER RECOVERY SYSTEM

Origin: International Space Station, 2008

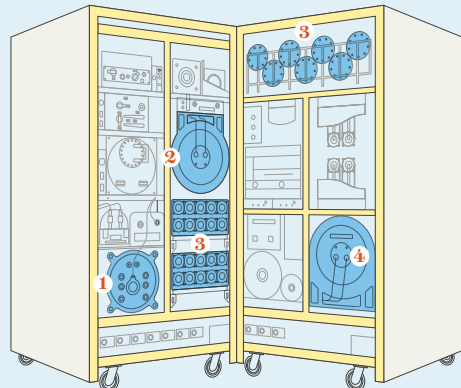
Transported to the ISS by the space shuttle *Endeavour*, the Water Recovery System collects and processes condensate from breath and sweat, gray water, and urine from humans and lab animals, resulting in 93 percent of the water being recycled. Although the Russians onboard refrain for the time being from recycling their urine, it is stored by American crew members for their own consumption.

1 Urine is distilled in a centrifuge to compensate for lack of gravity

2 Resulting water is combined with other wastewater streams

3 Filters remove gases and solids; catalysis removes microorganisms

4 Water is tested by onboard sensors and collected in a tank





WATERMARKS

by Donovan Hohn

Where does a story begin? The fiction is that they do, and end, rather than that the stuff of a story is just a cup of water scooped from the sea and poured back into it.

—Rebecca Solnit

In an age when man has forgotten his origins and is blind even to his most essential needs for survival, water along with other resources has become the victim of his indifference.

—Rachel Carson

In 1849, after hearing Ralph Waldo Emerson deliver the lecture “Mind and Manners in the Nineteenth Century,” Herman Melville, in one of his bouts of enthusiasm, scribbled a letter to a friend. “I love all men who *dive*,” he declared. The first time I read that declaration, I pictured Ralph Waldo at the end of a diving board wearing a swimsuit—a full-body swimsuit, perhaps, of the sort that might have been fashionable at the time—and maybe an oilskin swimmer’s cap, a pair of goggles made of, I don’t know, isinglass. This is pure fancy, of course. The high dive had not been invented in 1849. Nor had Americans yet learned to chlorinate water or domesticate the swimming pool. Water in 1849 was for ablutions and baptisms; for drinking; for irrigating fields and powering mills; for harvesting in its various phases—vapor, liquid, ice; for traveling over in boats. Keep reading Melville’s letter and it becomes clear that he’s picturing a different sort of diver. He’s imagining Emerson as a kind of philosophical whale, sounding the depths.

Lapham’s Quarterly inaugurates the second decade of its existence by occasionally recruiting the introductory essay from writers blessed with a broad knowledge of the topic at hand. Donovan Hohn is the author of *Moby-Duck: The True Story of 28,800 Bath Toys Lost at Sea*. He teaches creative nonfiction in the graduate writing program at Wayne State University and is at work on his second book, about the inner coast of America. Lewis H. Lapham will return to this space in the next issue.



Narcissus, detail of a handscroll by Zhao Mengjian, mid-thirteenth century.

At the time he wrote that letter, wagon trains were leaving Missouri, heading west. A year later, in 1850, when Melville began work on *Moby Dick*, he included in its opening chapter a meditation on the metaphysics of water with some dubious advice for the pioneers: “Let the most absentminded of men be plunged in his deepest reveries—stand that man on his legs, set his feet a-going, and he will infallibly lead you to water, if water there be in all that region.” Perhaps thinking of Emerson, he adds: “Should you ever be athirst in the Great American Desert, try this experiment, if your caravan happen to be supplied with a metaphysical professor. Yes, as everyone knows meditation and water are wedded for ever.”

And if your company does not include a metaphysical professor? If you found yourself without water, out there in the Great American Desert in 1849? Or in the parched precincts of Cape Town in 2018? What then?

Accounts come down to us, among them a vivid report filed in 1906 by an adventuresome scientist named W.J. McGee (*Yuma County, AZ*, page 37), who investigates the thirsty case of a wayward prospector named Pablo Valencia. Valencia had barely survived for “nearly seven days” without water in the summer heat of the Arizona Territory, snacking on scorpions and drinking his own urine. Having examined the patient’s symptoms, McGee divides the physiology of thirst into three stages. There is “the stage of normal dryness,” familiar to all of us. Then comes “the stage of functional derangement.” The tongue clings to the teeth. The eustachian tubes burn. The skin tightens painfully over the skull like the head of a drum. The brain and spine ache. The voice cracks. The mind begins to go: “un-reasoned revulsions arise against persons and things, while water and wetness are

subconsciously exalted as the end of all excellence.” Finally comes “the stage of structural degeneration,” which is as bad as it sounds, characterized by McGee as “a progressive mummification of the initially living body.”

Life as we know it can survive without sunlight and oxygen: witness the creatures that populate the sulfurous vicinity of submarine hydrothermal vents. Life as we know it cannot live without water, and where there is water, there is almost always life. “I discovered living creatures in rain, which had stood but a few days in a new tub,” Antonie van Leeuwenhoek (*Delft*, page 65) observed in 1675 after peering through his invention, a new and better microscope. A grown man like Pablo Valencia can last three weeks without food; without water, at most several days. For good reason, in its search for extraterrestrial life, NASA has defined the “habitable zone” as “the distance from a star where one can have liquid water on the surface of a planet.” We earthlings are at no risk of exiting our sun’s habitable zone anytime soon, but the reports arriving from McGee’s successors—of rising waters in Miami and Bangladesh, of poisoned waters in Fiji and Flint, of dwindling reservoirs and depleted aquifers—are troubling enough to make one wonder if the entire planet has already entered a stage of derangement. Clean water in this coming century, credible oracles predict, will become more valuable than oil, an accelerant to conflagration as well as conflagration’s antidote. The aging waterworks of America, meanwhile, seem well on their way toward McGee’s stage of structural degeneration.

There’s plenty of water in the universe without life, but nowhere is there life without water.

—Sylvia Alice Earle, 1995

This is a thirsty issue of *Lapham’s Quarterly*, an exaltation of water and wetness. The writers gathered in these pages walk the banks of rivers, from the Danube to the Yangtze to the Nile. They embark. They put on waders and conduct sampling expeditions. They douse. They sound. They visit aqueducts and public baths and bottling plants. They dive—sometimes without leaving their desks. Like the cub river pilot Samuel Clemens, they read ripples, fathom depths, chart currents, decipher water’s secrets (*Mississippi River*, page 28). They seek to acquire fluency in fluency. “I am haunted by waters,” Norman Maclean wrote from the banks of the Blackfoot River. “I am haunted by waters,” Olivia Laing repeats (*Sussex*, page 186), in affirmation, from the banks of the River Ouse.

Growing up in San Francisco’s semisuburban outskirts during the drought years of the 1970s, I learned early on to treat water not only as an elemental source—of life and cleanliness, meditation and metaphor—but as that drier abstraction, a natural resource. The California of my childhood was the one Joan Didion (*Malibu, CA*, page 169) wrote about the year I turned five, the coastal terminus of the American West, a region whose borders were drawn by drought. “The West begins where the average annual rainfall drops below twenty inches,” Bernard DeVoto (*Cambridge, MA*, page 75) wrote, a definition Didion endorses, and to which she attributes her own “reverence for water”—for water and in her case for the waterworks with which Westerners had made deserts bring forth orange groves and swimming pools. Where Didion saw order wrung from nature’s chaos, adopted Westerner Edward Abbey (*Utah*, page 138) saw order’s illusion, evidence of hubris and folly. Didion would extol a dam that Abbey would blow up. Water invites

such contradictions. It purifies and corrupts, sustains life and destroys it. Water rusts and rots, and it preserves. “Kinds of water drown us. Kinds of water do not,” Anne Carson writes (*Buergete*, page 125), distilling the conundrum to a riddle.

Our family dutifully obeyed the exhortations issued by local officials: Let the lawn yellow, the station wagon gather dust. Turn the faucet off while brushing your teeth. These austere rituals required a suspension of disbelief and a faith in the wisdom of bureaucrats, for the world as we experienced it appeared in no danger of running short of water. If you left the faucet on, the water ran until you shut the faucet off, and when wildfires broke out in the golden hills, as they did almost every summer, the fire trucks never failed to answer the alarm, and with rare exception, the hydrants summoned forth from beneath the sidewalk a gusher commensurate to the flames.

My parents were both churchgoers, and when I first encountered the opening chapters of the Bible, I recognized the description there of an earthly realm stretched between waters above and waters below. Our house occupied a foggy altitude, and its windows often opened onto heavens of mist—evaporate from the Pacific that would condense in the cooling air, rolling in and out like a tide. When the fog washed onto the mountains of California’s coastal range, it turned their upper slopes into a littoral zone, their peaks into islands, our cul-de-sac of stucco row houses—painted the pastels of a coral reef—into a foggy Atlantis.

Collecting in the branches of the redwoods and eucalyptus trees, the fog watered the ferny understory of the temperate forests. On those rare occasions when a downpour broke the dry spell, the slopes would liquefy. The evening news would feature footage of highways and bungalows buried under mud. A culvert beside our neighbor’s house channeled rivulets of runoff to the curbside gutter, where it swelled into a little river, my own diminutive Mississippi on whose muddy waters

If you can't go through an obstacle, go around it. Water does.

—Margaret Atwood, 2005

I would perform experiments in hydrology, building dams of pebbles and dirt, studying currents, setting leaves adrift—efforts at water management that were as futile as those of the Army Corps of Engineers during the Great Flood of 1927, as futile in the long run as most human efforts to control water and contain it. The curbside rivulet always found its way to the sewer grate by the lamppost, where it would disappear into a mysterious darkness out of which there rose an odor of swamp. Anyone requiring a lesson in the hazards of flood control need only read John McPhee’s account of his travels around the Louisiana Delta (*Simmesport, LA*, page 173) or Jesmyn Ward’s novel set in the mayhem of Hurricane Katrina (*Bois Sauvage, MS*, page 179), or revisit the footage aired last autumn when the waters above and below conspired to inundate Houston and San Juan. Water is the universal solvent, of schemes as well as substances.

In motion, it seems alive, motivated by a kind purpose as it seeks its level, its surface sinuous, muscular, as if animated by serpents or spirits, which helps explain all those fantastic monsters and mermaids and river gods that have populated the waters of the human mind. All matter is in motion, physicists and Heraclitus tell us, but the motion of water, unlike that of atoms or stone, readily accommodates our powers of perception, the timescale of a human life. The motion of water is luminous and momentary. No wonder so many writers throughout the centuries,



Golden Gate Bridge, 2.13.01, 5:32pm, by Richard Misrach, 2001.

while walking beside a river or a Venetian canal, have, like Joseph Brodsky (*Venice*, page 161), glimpsed through their own reflections a metaphor for time. Leonardo da Vinci, in his notebooks (page 204), made plans for a treatise on water in which he would “describe all the shapes that water assumes, from its greatest to its smallest wave.” I understand the impulse.

Lapsed though I am, I’m still stirred by the poetics of the flood in Genesis 6—how the fountains of the deep burst forth and the windows of heaven open. Judaism, Christianity, Islam—they may all be “desert religions,” sure, but they are also, like most faiths people have observed all over the world and throughout the recorded centuries, religions of water. The Bible is a soggy book. Witness how many miracles and divine interventions occur on water, or at its edge. In 2 Kings a leper named Naaman takes a curative dip in the spa of the Jordan River. John the Baptist spends his days there, busy as the attendant of a profitable car wash. Jonah, that reluctant aquanaut, quiets the Mediterranean. Moses bloodies the Nile, parts the Red Sea, and in his downtime meets his future wife at a watering hole. Jesus saunters around, barefoot as a water skeeter, on the surface of Galilee. For good reason, many religious pilgrimages terminate in sources and springs. The Quran (page 181) is likewise soggy, promising faithful believers an afterlife with “gardens graced with flowing streams” and “rivers of water forever pure.” Every living thing in the Quran is made of water. “To a desert culture,” writes historian Garry Wills, “water is not only needed for life. It is life. It is the material thing nearest to God.” In a desert, all waters are holy.

Then again, people sanctify water in rainy latitudes too. In Vietnamese, the word for water is also the word for homeland. And in polar ones. Several summers

ago, I found myself taking a walk under the midnight sun along the shores of the Northwest Passage accompanied by an Inuit kid named Puglik. In the mining town of Cambridge Bay, where we'd met, many working adults sleep through the sunlit night. Their children, some of them, play by night and sleep by day. I was staying with an archaeologist who'd spent the summer field season, now nearly over, excavating a Thule house pit on the town's outskirts. As the Arctic permafrost thaws, such sites, preserved for centuries, are at risk of melting away, and my archaeologist friend thought I might like to see one while I had the chance. On our way out of town, we ran into Puglik kicking at the bark chips under the monkey bars of a public playground. He was underdressed in what looked like hand-me-downs: a hooded sweatshirt with sleeves long enough to warm his fingertips and a pair of white sneakers so big I could have worn them. Bored, he asked to join us.

The road was muddy. The Arctic in summer's thaw is a muddy place, muddier and muddier as the planet warms. For underdressed pilgrims on a hike, however, the weather was still plenty cold. A wind refrigerated by sea ice was giving us all the shivers, and Puglik kept wiping his nose with his sleeve, carrying on about his favorite video games and pointing out local landmarks. In a graveyard atop a hill, wooden crosses had begun to topple and tilt. His ancestors were all buried there, at least the ones he knew about, Puglik said, but now the entire hill was thawing, the graveyard slowly sliding toward the sea.

To windward flowed a glassy stream in which you could see a weir, a funnel of rocks with which locals corralled fish for easy harvesting, as people had been doing since the ice sheets retreated. The stream was popular with migrating waterfowl as well as fish. Geese that had wintered in Biloxi nested here on the tundra. We know that migrating birds follow spring. They're chasing sunlight, of course, but they're also

Best is water.

—Pindar, 476 BC

chasing wetlands; they, too, make pilgrimages to water. We came to a bend in the road that conformed to a bend in the stream, and in the stream's bend was an eddy that conformed to some invisible bend in the cosmos, deep enough for a swimming hole. "We call this part of the river," Puglik said, "an 'Inuit Jacuzzi.'"

I'd come to Cambridge Bay in the company of scientists studying its changing ecology and climate, and while traveling through the Northwest Passage aboard an icebreaker, I'd joined a cryologist with the Canadian Ice Service on a survey conducted by helicopter. The cryologist—or "ice pick," as people in her line of work are colloquially known—had to chart and classify the puzzling ice pack visible below. Although it had thawed and thinned earlier than it had in any previous year on record, there remained a multitude of ice to see and classify. The names for its varieties, I learned, are as numerous and lovely as those for clouds: *frazil*, *pancake*, *nilas*, *grease*, *agglomerated brash*. The language of ice describes more than dimensions and shapes. It names subtle gradations in the phase changes water undergoes as it solidifies and expands or liquefies and condenses.

With our terrestrial eyes, we are good at perceiving and classifying water in its solid and vaporous forms. The vernacular for liquid water is meager by comparison. Since the time of the ancient Phoenicians, if not before, navigators and river pilots have learned to read water's surface well, but it was only over the past

century or so that limnologists and oceanographers have begun studying and classifying underwater formations shaped by chemistry and thermodynamics—dense masses drifting through the twilight zone like underwater clouds, or vortices spinning around like underwater storms. We’re still acquiring fluency in fluency.

These days I live in southeast Michigan, which is to say I dwell in a watershed of paradox. Here we are, at the edge of the Great Lakes, which together contain 84 percent of North America’s and 20 percent of the world’s accessible freshwater. The Great Lakes are puddles of glacial melt. Rainfall and tributaries contribute only 1 percent of their total volume. Much of the rest is “fossil water,” sequestered from the water cycle since the last ice age. Under a recently issued state permit, the Nestlé corporation, a major purveyor of bottled water, can now draw up to four hundred gallons of Michigan groundwater per minute for just two hundred dollars a year. And yet in Flint, people now regard their faucets with warranted suspicion, and in Detroit, whose water treatment plant would have spared the people of Flint from mass poisoning, the water company has been turning the spigots off, letting their delinquent customers go thirsty or purchase bottled water from Nestlé.

Two years ago, during the federal emergency in Flint, I spent some time in the city following a team of civil engineers conducting an investigation. I watched as contractors excavated a residential street, extracting a service line from under the asphalt. The line—a few dozen yards of copper pipe—was evidence at a crime scene, and the scientists labeled it with forensic care. Looking at it coiled on a sun-dappled lawn, dirt still clinging to the copper, I experienced a feeling that I later recognized as disenchantment. What I couldn’t get over was how small the pipe’s diameter was: three-quarters of an inch. This was it? The source of the everyday magic?

Iron may break gold, but water remains whole.
—Ge Hong, c. 300

For most of my life, running water had been one of those technologies, like the telephone or electric light, that I took for granted. Where the water came from and where it went when it gurgled down the drain were both mysteries that I’d only rarely wondered about. Living in the age of indoor plumbing is a bit like living beside a stream whose headwaters and mouth are distant rumors. The waterworks of wealthy nations, or at least those of certain zip codes, are a kind of man-made River Lethe. In imperial Rome the aqueduct was a public monument as well as an engineering feat. Buried underground, our own aqueducts invite forgetting. In New York City the subterranean water tunnels constitute, writes David Grann (page 95), “a city under the city,” one that few New Yorkers know about, let alone ever see.

We forget the value and scarcity of potable water. Most of the planet’s 332 million cubic miles of water is salty. “Only 2 percent is fresh,” Rose George reports in her 2008 study of human-waste management, *The Big Necessity*, “and two-thirds of that is unavailable for human use, locked in snow, ice, and permafrost.” We forget how much of it we waste—we Americans especially. While about a billion people get by on five liters of water a day, Americans use more than twice that in a single toilet flush. We forget the people—some 30 percent of the global population—who do not have easy access to safe drinking water. We forget what life was like prior to the advent of chlorination.

For reminders, we can read the diary that Carolina Maria de Jesus kept in 1958 (page 46), documenting the daily life of a São Paulo favela whose inhabitants lined up every morning at a public spigot and fished from a polluted lagoon. We can visit Victorian London and witness cholera spread from a single contaminated pump, or make a pilgrimage to the sacred grotto of Lourdes, where in 1894 Émile Zola (page 49) watched the Catholic faithful immerse themselves in “a frightful consomme of all ailments, a field of cultivation for every kind of poisonous germ, a quintessence of the most dreaded contagious disease.”

During one of my trips to Flint, I went to have a look at the city’s notorious river. The downtown promenade was buried deep in snow. A single pedestrian had gone promenading anyway, leaving behind a trail of boot prints that led from the salted sidewalks of Saginaw Street down a flight of concrete stairs to the concrete quay at the river’s edge. I followed them. A hundred yards upstream, the Flint frothed and boiled through an open lock, but by the time it reached me, its surface had settled to a low simmer. To the naked eye, it didn’t look so bad. I wasn’t tempted to kneel down and fill up a canteen—the water was opaque and khaki green, like rancid olive oil—but dead fish weren’t floating on its surface. If I’d dropped a match,

No man can light a fire in the water.

—Tibetan proverb

it wouldn’t have caught fire, as the Cuyahoga and the Chicago used to. The air above it didn’t stink. Having once gone boating on the Des Plaines River, outflow of Chicago’s Sanitary and Ship Canal, and having visited the Hudson after a rainstorm had overwhelmed Manhattan’s storm

drains, I’d seen and smelled worse. Upstream from me, a pair of Canada geese on a snowy bank appeared to be enjoying their waterfront view. If I hadn’t known better, I’d never have guessed that I was looking at the wellsprings of disaster.

This is yet another source of water’s mystery: its exact makeup is inscrutable to the naked eye and to our other senses. You need a compound microscope or a mass spectrometer to determine whether you’ve filled your drinking glass with the waters of life or a consomme of ailments. What discolored the sampling bottles Flint’s residents had held before the television cameras in 2015 was iron corroded from rusty pipes. Corroded lead, once dissolved, is odorless and invisible.

Whenever I visit a river, I have the urge to follow it. The Flint flows west, and if I’d continued my promenade in that direction, I’d have reached, fifty miles downstream, the confluence with the Shiawassee, which flows northeast into the Saginaw, which empties into Saginaw Bay, which opens onto Lake Huron, which is itself, in truth, an immense caesura in a slow-moving stream whose headwaters lie at the western end of Lake Superior and whose terminus is the Gulf of Saint Lawrence, which opens onto the North Atlantic. The journey of a river from source to mouth resembles our own journey from birth to death, an analogy oft remarked, and yet the beginnings and endings of rivers are as fictional as those we impose on stories. There are headwaters to headwaters and no river ever really ends.

I have over several years followed the water through the outskirts of Chicago, over Niagara Falls, down the Mississippi. I’ve traveled Lake Erie by sailboat, the Saint Lawrence by canoe, chasing a ghost geography, a relic map, hidden behind the pixelated roads and interstates charted by my Global Positioning Sys-



Delaware Water Gap, by George Inness, 1861.

tem. Since moving to Michigan, trying to understand the place, I've studied its recorded history, which does have a beginning, in the accounts written in the seventeenth century by the French. Flipping in chronological order through their hand-drawn maps, you can watch the familiar geography emerge as if out of the water. At first, water is all there is, a meandering of riverbanks and coastlines in the midst of a vast blankness. Even the place names are watery. *Michigan* is transliterated Algonquian for "Big Water," and all around the Great Lakes are towns and streets named for rapids and portages. The early history of the American Midwest was written from the vantage of a canoe. "Rivers must have been the guides which conducted the footsteps of the first travelers," wrote Henry David Thoreau (*Concord, MA*, page 158) after voyaging with his brother on the Concord and the Merrimack. "They are the constant lure, when they flow by our doors, to distant enterprise and adventure; and, by a natural impulse, the dwellers on their banks will at length accompany their currents to the lowlands of the globe, or explore at their invitation the interior of continents."

In the twenty-first century, it's not easy to follow the water. Beyond downtown riverfront promenades, one enters a semiferal, semi-industrial no-man's-land, an inside-out version of America hidden from the view from a sidewalk or a driver's seat. Along the Lower Mississippi, between the levees and the water's edge, the river's flood stages have kept development at bay, preserving an accidental wetland wilderness, a landscape of incongruities accessible only by boat. Haul out beside the outflows of petrochemical refineries, climb over the batture and through the willows, watching for fire ant mounds and poison oak, and you can emerge onto the shores of a nameless pond, the remnant of an oxbow meander where alligators are sunning in the shallows and a hundred roseate spoonbills and pelicans, startled by your startlement, burst loudly into flight.

Below the water's surface lie more lost worlds. Water remembers what we might otherwise forget, in part because what we wish to forget, we jettison. We pretend that to throw something into the East River or the ocean is to make it disappear, when really its disappearance is an illusion, a vanishing act. The Great Lakes, I've learned, are especially good at remembering. In the cold, fresh, oxygen-depleted refrigerator of their depths, wrecks and other sunken relics last longer than they would in the ocean, where salt corrodes metal, and wood becomes food for teredo worms. In Thunder Bay, at the northwestern edge of Lake Huron, there is a kind of underwater museum—the Thunder Bay National Marine Sanctuary, it's called. Visit the sanctuary's website, and you can go diving without leaving your desk. Shipwrecks appear on a map. Click on one, and the name of some doomed vessel pops up, alongside spooky photographs of its phantasmal remains.

Here is the steel freighter *Norman*, which during the Gilded Age ferried ore to the Globe Iron Works in Cleveland, Ohio, and now sits in two hundred feet of water, where it has grown popular with zebra mussels. Here is the *Montana*, which caught fire in 1914. Here is the delightfully named *Typo*, a three-masted schooner

The mill will never grind with water that is past.

—Daniel McCallum, 1870

erased from the lake surface by a fast-moving steamer in 1899. Four sailors drowned. The *Typo* is still carrying a load of coal it will never deliver, and a ship's bell still hangs in the belfry. If you were willing to piss off the archaeological custodians in charge of Thunder Bay and risk tangling

your flippers in the ancient riggings, you could swim down to the decks of the *Typo* and give the bell a ring. Had any of these vessels made it to safe harbor, they would likely be long gone.

There's a bumper sticker popular in these parts that shows a map of the five Great Lakes beside the caption UNSALTED, SHARK-FREE. The first time I saw it, it occurred to me that an opportunity had presented itself. Suffering from a phobia of sharks, I'd never gone scuba diving, though I'd wanted to. And so, not long ago, after completing the requisite training, I found myself perched on the rail of a fishing boat, tugging a pair of flippers on over a pair of neoprene booties.

The fishing boat was anchored off Poverty Island, one of several in a chain of uninhabited islands at the northern end of Lake Michigan that obstruct the entrance to Green Bay. Also aboard the fishing boat was a shipwreck hunter and a team of commercial divers he'd hired. The shipwreck hunter had spent three decades and upwards of a million dollars searching for a wooden French brigantine last seen in 1679. He was convinced he was on the verge of finding it. The trail of clues he'd assembled in the historical archives seemed to him unassailable, and he'd brought me along to document his triumph. Not all men who dive are philosophers, I now know. Some of them are retirees squandering their life fortunes on misbegotten hunts for missing ships.

In emails, the shipwreck hunter had referred to our outing as an expedition and had dressed accordingly, which is to say nautically, in a navy blue windbreaker and a navy ball cap embroidered with golden laurels. On the windbreaker, stitched over his heart, was a date, 1679, and the name of the ship, *Le Griffon*, for which he had spent most of his adulthood searching. A little icon of the ship sailed above

his ball cap's bill, encircled by the words *Imagine, Explore, Discover*. He'd meant to bring matching *Le Griffon* T-shirts for everyone aboard the fishing boat to make the expedition feel more expeditionary, but he'd forgotten them back at his condo. This trivial oversight seemed to fill him with outsize regret.

Connected to the surface by a braid of hoses known, poetically, as "the umbilical," the commercial divers had gone overboard one by one, wearing "hard hats," modern-day versions of the diving helmets worn by the aquanauts you might encounter in an illustrated edition of Jules Verne, or seated on a plastic treasure chest at the bottom of a decorative aquarium. Walking around in weighted boots, scanning the lake bed with handheld magnetometers, the commercial divers hadn't found much aside from driftwood. The Great Lakes are good at remembering; they're also good at obliterating. Nevertheless, the shipwreck hunter had agreed to send me down, and the time had come.

Perched on the rail of the fishing boat, tugging on my flippers, wearing a rented seven-millimeter wet suit, I was beset by second thoughts. At scuba school the instructor had elaborated in memorable detail the assorted gruesome ways that scuba diving can abbreviate a life, the most memorable of which to my mind was this: ascend too quickly without exhaling, and your lungs will pop like balloons. At bottom, sixty feet down, it would be a comparatively warm thirty-eight degrees Fahrenheit. Sometimes, at the bottom of the Great Lakes, liquid water descends below the freezing point without freezing, on account of the pressure. Into their suits, the commercial divers had pumped, through one of the hoses braided into the umbilical, heated water. The shipwreck hunter had told me that my exposed face might feel as if it had been "stung by bees," but a seven-millimeter suit would be warm enough, he'd assured me.

There is no small pleasure in sweet water.

—Ovid, *c. 10*

In my head, to calm myself, I recited the opening lines of Adrienne Rich's "Diving into the Wreck":

First having read the book of myths,
and loaded the camera,
and checked the edge of the knife-blade,
I put on
the body-armor of black rubber
the absurd flippers
the grave and awkward mask.

You may think this an embellishment, that perched on the rail of a fishing boat, squeezing your nostrils shut, preparing to tumble backward overboard, you'd have better things to think about than a poem, but I promise you I'd committed those lines to memory—because I wanted to write about the experience someday, yes, but also because I wanted more than the bright white nylon anchor line to guide me down into Lake Michigan's cerulean immensity, and because I wanted to remember why it was I was doing this. I was doing this because I'd imagined that descending the water column would be like time travel, like flipping into the past, as if fathoms were centuries.



WELLSPRING

2016: Standing Rock

LOUISE ERDRICH AMONG THE WATER PROTECTORS

The snow-scoured hills and buttes of the Missouri Breaks are dotted with isolated houses, until the sudden appearance of the Oceti Sakowin encampment on the Standing Rock Sioux Reservation. The presence of so many people catches at the heart. Snow-dusted tepees, neon pup tents, dark-olive military tents, brightly painted metal campers, and round solid yurts shelter hundreds on the floodplain where the Cannonball River meets the Missouri. Flags of Native Nations whip in the cutting wind, each speaking of solidarity with the Standing Rock tribe's opposition to the Dakota Access Pipeline owned by Energy Transfer Partners and Sunoco Logistics. This pipeline would pass beneath the Missouri River and imperil drinking water not only for the tribe but for farmers, ranchers, and townspeople all along the river's course.

On December 3, veterans from all over the country began to arrive at Standing Rock. Jack Dalrymple, the governor of North Dakota, and the Army Corps of Engineers had called for

the camp to be cleared of protesters, who from the beginning have preferred the term *water protectors*, on the fifth. Vehicles were lined up for nearly a mile to get into the camp. It did not seem possible that many more people could fit onto the space, but somehow the camp seemed to morph to hold envoys from all over the globe. To name a few: Maori, Muslims, delegations of priests and ministers, people from more than ninety Native Nations, plus any number of Europeans and various rock stars. The curious came, the bold, the devoted, not to mention the Water Wookie Warriors, whose pop-up camper had a *Star Wars* theme; passionate young Native people as well as seasoned elders joined the resistance camp. The arrival of veterans adept at winter survival and ready to join the fight against the pipeline was yet another influx.

A small group of veterans in various patterns of camouflage gathered before their first briefing, standing in the sun outside the tiny plywood and thermal-sheathed headquarters at the eastern

1800: Lake Valencia

SUNKEN PLACE

I have no doubt that from remotest times the whole of Aragua Valley was filled with water. Everywhere the shape of the promontories and their steep slopes reveals the ancient shore of this alpine lake. Wherever a hut is built on the lakeshore, you can see how year by year the water recedes. As the water decreases, you can see how islands begin to join the land while others form promontories or become hills.

The destruction of the forests, the clearing of the plains, and the cultivation of indigo over half a century has affected the amount of water flowing in as well as the evaporation of the soil and the dryness of the air, which forcefully explains why the present Lake Valencia is decreasing. By felling trees that cover the tops and sides of mountains, men everywhere have ensured two calamities at the same time for the future: lack of fuel and scarcity of water. Trees, by the nature of their perspiration and the radiation from their leaves in a cloudless sky, surround themselves with an atmosphere that is constantly cool and misty. They affect the amount of springs by sheltering the soil from the sun's direct actions and reducing the rainwater's evaporation. When forests are destroyed, as they are everywhere in America by European planters, with imprudent haste, the springs dry up completely, or merely trickle. Riverbeds remain dry part of the year and are then turned into torrents whenever it rains heavily on the heights. As grass and moss disappear with the brushwood from the mountainsides, so rainwater is unchecked in its course. Instead of slowly raising the river level by filtrations, the heavy rains dig channels into the hillsides, dragging down loose soil and forming sudden, destructive floods.

Alexander von Humboldt, from *Personal Narrative of a Journey to the Equinoctial Regions of the New Continent*. Humboldt resigned from his job in the Prussian Department of Mines in 1797, hoping to go on a scientific expedition. Writing elsewhere about his travels down the Amazon River with botanist Aimé Bonpland, he tells of encountering green stones that are "known as Amazon stones" because Indians claim they come from a country of "women without men." He died in 1859 in Berlin.

edge of Oceti Sakowin. There had been rumors that supply stores in the area were not serving anti-DAPL customers, and that police were blocking or fining anyone who attempted to

bring building supplies to Standing Rock. But a few feet away, supplies were being unloaded and a barracks was quickly taking shape.

On October 7, Dalrymple had requested backup for the Morton County police under the Emergency Management Assistance Compact, which is normally used for natural disasters. Officers from twenty-four counties and sixteen cities in ten different states responded, bringing military-grade equipment, including Stingrays (cell-site simulators) and armored personnel carriers purchased under recent federal grants. On the night of November 20, police weaponized water against the water protectors, causing seizures and hypothermia. The next day the county sheriff, Kyle Kirchmeier, said at a press conference, "It was sprayed more as a mist, and we didn't want to get it directly on them, but we wanted to make sure to use it as a measure to help keep everybody safe."

As we waited at the camp, in warm sun, I asked veterans at what moment they had decided to meet here. Most of them talked first about online videos of riot-gear-clad police using water cannons in subfreezing weather, of masked police teargassing water protectors, of Native people being maced as they held their hands up, and of the use of attack dogs. The disturbing scenes initiated by the Morton County police and other police units were instrumental in activating increased support for Oceti Sakowin.

Some said that they regarded maintaining a clean water supply as a homeland-security issue, and corporate greed as the enemy. Other veterans talked about the oath they had taken to defend their country from "enemies, foreign and domestic."

A veteran sporting reflective sunglasses and an undercut man bun hopped up on a tree stump and began explaining that the mission many of them had in mind—to link arms in front of the water protectors while wearing their uniforms, walk forward, and take whatever punishment the Morton County police cared to deal them—was probably not on the Standing Rock tribe's agenda.



Hunting on the Lagoon (detail), by Vittore Carpaccio, c. 1490.

Later that day tribal leaders held a meeting at Sitting Bull College. Two local veterans, Loreal Black Shawl and Brenda White Bull, took charge.

David Archambault II, the tribal chair, who from the beginning has led the resistance to the DAPL pipelines, told the veterans, “What you are doing is precious to us. I can’t describe the feelings that move over me. It is *wakan*, sacred. You all are sacred.”

On the afternoon of December 4, the Army Corps of Engineers made the stunning announcement that it had denied Energy Transfer Partners an easement to cross under the Missouri River. In the end, though, the veterans did take on a lifesaving mission. In every way that they could, they helped secure the camp against what turned out to be a blizzard of unexpected intensity. The blizzard arrived on December 5, and in the deep cold that followed, veterans reinforced shelters and helped maintain a spirit of cooperation that enabled the thousands of new camp members to survive their experience on Standing Rock.

Besides frostbite, what did people take away from there? This was probably the first

time many non-Native people had been on a reservation, or in the presence of Native ceremonies. The more people understand that Native Americans have their own religious rituals and objects of veneration—which to many non-Native people are simply features of the landscape—as well as cathedrals and churches, the better. Understanding the natural world as more than just a resource for energy, or a recreational opportunity, or even a food resource, gives moral weight to the effort to contain catastrophic climate change. Imagine if Energy Transfer Partners planned to drill underneath Jerusalem. Of course, the company wouldn’t consider such a route. Yet it would be safer than drilling beneath the Missouri River.

From “Holy Rage: Lessons from Standing Rock.” In February 2017 the Army Corps of Engineers granted a final easement, allowing construction of the pipeline to be completed. Sioux tribes sued on religious grounds, but a circuit court denied the motion in March, arguing that the pipeline would not place a “substantial burden on its members’ free exercise of religion”; the pipeline was completed in April. The oldest of seven children from a family of German, French, and Turtle Mountain Chippewa descent, Erdrich was born in Minnesota in 1954. She has published more than fifteen novels.



River Landscape, by Jan Pieter Veth, 1878.

1857: Mississippi River

WATER READING

I had often seen pilots gazing at the water and pretending to read it as if it were a book; but it was a book that told me nothing. A time came at last, however, when Mr. Bixby seemed to think me far enough advanced to bear a lesson on water reading. So he began: “Do you see that long slanting line on the face of the water? Now, that’s a reef. Moreover, it’s a bluff reef. There is a solid sandbar under it that is nearly as straight up and down as the side of a house. There is plenty of water close up to it, but mighty little on top of it. If you were to hit it, you would knock the boat’s brains out. Do

you see where the line fringes out at the upper end and begins to fade away?”

“Yes, sir.”

“Well, that is a low place; that is the head of the reef. You can climb over there and not hurt anything. Cross over, now, and follow along close under the reef—easy water there—not much current.”

I followed the reef along till I approached the fringed end. Then Mr. Bixby said, “Now get ready. Wait till I give the word. She won’t want to mount the reef; a boat hates shoal water. Stand by—wait—*wait*—keep her well in hand. *Now* cramp her down! Snatch her! Snatch her!”

He seized the other side of the wheel and helped to spin it around until it was hard down, and then we held it so. The boat resisted, and

refused to answer for a while, and next she came surging to starboard, mounted the reef, and sent a long, angry ridge of water foaming away from her bows.

“Now watch her; watch her like a cat, or she’ll get away from you. When she fights strong and the tiller slips a little, in a jerky, greasy sort of way, let up on her a trifle; it is the way she tells you at night that the water is too shoal; but keep edging her up, little by little, toward the point. You are well up on the bar, now; there is a bar under every point because the water that comes down around it forms an eddy and allows the sediment to sink. Do you see those fine lines on the face of the water that branch out like the ribs of a fan? Well, those are little reefs; you want to just miss the ends of them, but run them pretty close. Now look out—look out! Don’t you crowd that slick greasy-looking place; there ain’t nine feet there; she won’t stand it. She begins to smell it; look sharp, I tell you! Oh blazes, there you go! Stop the starboard wheel! Quick! Ship up to back! Set her back!”

The engine bells jingled and the engines answered promptly, shooting white columns of steam far aloft out of the ‘scape pipes, but it was too late. The boat had “smelt” the bar in good earnest; the foamy ridges that radiated from her bows suddenly disappeared, a great dead swell came rolling forward and swept ahead of her, she careened far over to larboard, and went tearing away toward the other shore as if she were about scared to death. We were a good mile from where we ought to have been when we finally got the upper hand of her again.

During the afternoon watch the next day, Mr. Bixby asked me if I knew how to run the next few miles. I said, “Go inside the first snag above the point, outside the next one, start out from the lower end of Higgins’ wood yard, make a square crossing and—”

“That’s all right. I’ll be back before you close up on the next point.”

But he wasn’t. He was still below when I rounded it and entered upon a piece of river which I had some misgivings about. I did not

know that he was hiding behind a chimney to see how I would perform. I went gaily along, getting prouder and prouder, for he had never left the boat in my sole charge such a length of time before. I even got to “setting” her and letting the wheel go, entirely, while I vaingloriously turned my back and inspected the stern marks and hummed a tune, a sort of easy indifference which I had prodigiously admired in Bixby and other great pilots. Once I inspected rather long, and when I faced to the front again

Water is compulsive; it draws each of us to gaze transfixed in a becalmed state which few other things induce so forcibly.

—Mirabel Osler, 1989

my heart flew into my mouth so suddenly that, if I hadn’t clapped my teeth together, I should have lost it. One of those frightful bluff reefs was stretching its deadly length right across our bows! My head was gone in a moment; I did not know which end I stood on; I gasped and could not get my breath; I spun the wheel down with such rapidity that it wove itself together like a spider’s web; the boat answered and turned square away from the reef, but the reef followed her! I fled, and still it followed, still it kept—right across my bows! I never looked to see where I was going, I only fled. The awful crash was imminent—why didn’t that villain come! If I committed the crime of ringing a bell, I might get thrown overboard. But better that than kill the boat. So in blind desperation I started such a rattling “shivaree” down below as never had astounded an engineer in this world before, I fancy. Amid the frenzy of the bells, the engines began to back and fill in a furious way, and my reason forsook its throne—we were about to crash into the woods on the other side of the river. Just then Mr. Bixby stepped calmly into view on the hurricane deck. My soul went out to him in gratitude. My distress vanished; I would have felt safe on the brink of Niagara, with Mr. Bixby on the hurricane deck. He blandly and sweetly

1357: London

CRADLE OF FILTH

The king to the mayor and sheriffs of our city of London, greeting. Considering that the streets and lanes and other places in the city and the suburbs thereof, in the times of our forefathers and our own, were wont to be cleaned from dung, laystalls, and other filth and were wont heretofore to be protected from the corruption arising therefrom, from which no little honor did accrue unto the said city and those dwelling therein, and whereas now, when passing along the water of Thames, we have beheld dung and laystalls and other filth accumulated in divers places and have also perceived the fumes and other abominable stench arising therefrom; from the corruption of which, if tolerated, great peril as well to the persons dwelling within the said city, as to the nobles and others passing along the said river, will, it is feared, ensue unless, indeed, some fitting remedy be speedily provided for the same. We, wishing to take due precaution against such perils and to preserve the honor and decency of the city, do command that you cause as well the banks of the said river as the streets and lanes of the city and the suburbs thereof to be cleaned without delay, and the same when cleaned so to be kept; and in the city and the suburbs thereof public proclamation to be made, and it on our behalf strictly forbidden that anyone shall, on pain of heavy forfeiture unto us, place or cause to be placed dung or other filth to be accumulated in the same. And if any persons, after proclamation and prohibition so made, you shall find doing to the contrary hereof, you are to cause them so to be chastised and punished that such penalty and chastisement may cause fear and dread unto others perpetrating the like. And this, as you would preserve yourself safe and would avoid our heavy indignation, you are in nowise to omit.

From the Letter Books of the City of London. A set of folio volumes containing proceedings, ordinances, and other city business records from the early years of the reign of Edward I to near the end of the reign of James II, this collection derives its name from the alphabetical characters inscribed on the volumes' spines. Another ordinance, from 1345, describes how brewers and malt makers were depleting a conduit's potable water "to the common loss of the whole community." A fine was imposed of four pennies and the loss of the tankard or tine used to carry the water.

took his toothpick out of his mouth between his fingers, as if it were a cigar—we were just in the act of climbing an overhanging big tree, and the passengers were scudding astern like rats—and lifted up these commands to me ever so gently: “Stop the starboard. Stop the larboard. Set her back on both.”

The boat hesitated, halted, pressed her nose among the boughs a critical instant, then reluctantly began to back away.

“Stop the larboard. Come ahead on it. Stop the starboard. Come ahead on it. Point her for the bar.”

I sailed away as serenely as a summer's morning. Mr. Bixby came in and said, with mock simplicity, “When you have a hail, my boy, you ought to tap the big bell three times before you land, so that the engineers can get ready.”

I blushed under the sarcasm, and said I hadn't had any hail.

“Ah! Then it was for wood, I suppose. The officer of the watch will tell you when he wants to wood up.”

I went on consuming, and said I wasn't after wood.

“Indeed? Why, what could you want over here in the bend, then? Did you ever know of a boat following a bend upstream at this stage of the river?”

“No, sir—and I wasn't trying to follow it. I was getting away from a bluff reef.”

“No, it wasn't a bluff reef; there isn't one within three miles of where you were.”

“But I saw it. It was as bluff as that one yonder.”

“Just about. Run over it!”

“Do you give it as an order?”

“Yes. Run over it.”

“If I don't, I wish I may die.”

“All right; I am taking the responsibility.”

I was just as anxious to kill the boat, now, as I had been to save her before. I impressed my orders upon my memory, to be used at the inquest, and made a straight break for the reef. As it disappeared under our bows I held my breath; but we slid over it like oil.



Male Figures at the Site of "Swimming", by Thomas Eakins, 1884.

"Now don't you see the difference? It wasn't anything but a *wind* reef. The wind does that."

"So I see. But it is exactly like a bluff reef. How am I ever going to tell them apart?"

"I can't tell you. It is an instinct. By and by you will just naturally *know* one from the other, but you never will be able to explain why or how you know them apart."

It turned out to be true. The face of the water, in time, became a wonderful book—a book that was a dead language to the uneducated passenger, but which told its mind to

me without reserve, delivering its most cherished secrets as clearly as if it uttered them with a voice.

Mark Twain, from *Life on the Mississippi*. In 1859, two years after signing on as a pilot's apprentice in New Orleans, a twenty-three-year-old Samuel Clemens received his steamboat pilot's license, then worked on the Mississippi until the Civil War put an end to commercial riverboat traffic. "When I was a boy," Twain writes elsewhere in this book, "there was but one permanent ambition among my comrades in our village on the west bank of the Mississippi River. That was to be a steamboatman."

1959: Clear Lake, CA

CIRCLE OF LIFE

Water must be thought of in terms of the chains of life it supports—from the small-as-dust green cells of the drifting plant plankton through the minute water fleas to the fish that strain plankton from the water and are in turn eaten by other fish or by birds, mink, raccoons—in an endless cyclic transfer of materials from life to life. We know that the necessary minerals in the water are so passed from link to link of the food chains. Can we suppose that poisons we introduce into water will not also enter into these cycles of nature?

The answer is to be found in the amazing history of Clear Lake, California. Clear Lake lies in mountainous country some ninety miles north of San Francisco and has long been popular with anglers. The name is inappropriate, for actually it is a rather turbid lake because of the soft black ooze that covers its shallow bottom. Unfortunately for the fish-

ermen and the resort dwellers on its shores, its waters have provided an ideal habitat for a small gnat, *Chaoborus astictopus*. Although closely related to mosquitoes, the gnat is not a bloodsucker and probably does not feed at all as an adult. However, human beings who shared its habitat found it annoying because of its sheer numbers. Efforts were made to control it, but they were largely fruitless until, in the late 1940s, the chlorinated hydrocarbon insecticides offered new weapons. The chemical chosen for a fresh attack was DDD, a close relative of DDT but apparently offering fewer threats to fish life.

The new control measures undertaken in 1949 were carefully planned, and few people would have supposed any harm could result. The lake was surveyed, its volume determined, and the insecticide applied in such great dilution that for every part of chemical there would be seventy million parts of water. Control of the gnats was at first good, but by 1954 the treatment had to be repeated, this time at the rate of one part of insecticide in fifty million

Sunset at Seta, by Hiroshige, early nineteenth century.



parts of water. The destruction of the gnats was thought to be virtually complete.

The following winter months brought the first intimation that other life was affected: the western grebes on the lake began to die, and soon more than a hundred of them were reported dead. At Clear Lake the western grebe is a breeding bird and also a winter visitant, attracted by the abundant fish of the lake. It is a bird of spectacular appearance and beguiling habits, building its floating nests in shallow lakes of western United States and Canada. It is called the “swan grebe” with reason, for it glides with scarcely a ripple across the lake surface, the body riding low, white neck and shining black head held high. The newly hatched chick is clothed in soft gray down; in only a few hours it takes to the water and rides on the back of the father or mother, nestled under the parental wing coverts.

Following a third assault on the ever-resilient gnat population, in 1957, more grebes died. As had been true in 1954, no evidence of infectious disease could be discovered on examination of the dead birds. But when someone thought to analyze the fatty tissues of the grebes, they were found to be loaded with DDD in the extraordinary concentration of 1,600 parts per million.

The maximum concentration applied to the water was one-fiftieth part per million. How could the chemical have built up to such prodigious levels in the grebes? These birds, of course, are fish eaters. When the fish of Clear Lake also were analyzed the picture began to take form—the poison being picked up by the smallest organisms, concentrated and passed on to the larger predators. Plankton organisms were found to contain about five parts per million of the insecticide (about twenty-five times the maximum concentration ever reached in the water itself); plant-eating fish had built up accumulations ranging from forty to three hundred parts per million; carnivorous species had stored the most of all. One, a brown bullhead, had the astounding concentration of 2,500 parts per million. It was a house-that-Jack-built sequence, in which the large carnivores had eaten

the smaller carnivores, that had eaten the herbivores, that had eaten the plankton, that had absorbed the poison from the water.

Even more extraordinary discoveries were made later. No trace of DDD could be found in the water shortly after the last application of the chemical. But the poison had not really left the lake; it had merely gone into the fabric of the life the lake supports. Twenty-three months after the chemical treatment had ceased, the plankton

If you stain clear water with filth, you will never find a drink.

—Aeschylus, 458 BC

still contained as much as 5.3 parts per million. In that interval of nearly two years, successive crops of plankton had flowered and faded away, but the poison, although no longer present in the water, had somehow passed from generation to generation. And it lived on in the animal life of the lake as well. All fish, birds, and frogs examined a year after the chemical applications had ceased still contained DDD. The amount found in the flesh always exceeded by many times the original concentration in the water. Among these living carriers were fish that had hatched nine months after the last DDD application, grebes, and California gulls that had built up concentrations of more than two thousand parts per million. Meanwhile, the nesting colonies of the grebes dwindled—from more than one thousand pairs before the first insecticide treatment to about thirty pairs in 1960. And even the thirty seem to have nested in vain, for no young grebes have been observed on the lake since the last DDD application.

Rachel Carson, from *Silent Spring*. On its 1962 publication, Carson's book became an immediate catalyst for the environmental movement. A year later she was asked to appear at a Senate subcommittee to speak against the use of pesticides, particularly DDT. During the hearing Senator Ernest Gruening of Alaska cited the formidable influence of *Silent Spring*. “Every once in a while in the history of mankind,” he said, “a book has appeared which has substantially altered the course of history.”

C. 1800 BC: Egypt

HIGH-WATER MARK

Hail to you, Hapy, god of the Nile,
Sprung from earth,
Come to nourish Egypt!
Of secret ways,
A darkness by day,
To whom his followers sing!
Who floods the fields that Ra has made,
To nourish all who thirst;
Let's drink the waterless desert,
His dew descending from the sky.
Friend of Geb, lord of Nepri,
Promoter of the arts of Ptah.
Lord of the fish,
He makes fowl stream south,
No bird falling down from heat.
Maker of barley, creator of emmer,
He lets the temples celebrate.

When he is sluggish, noses clog,
Everyone is poor;
As the sacred loaves are pared,
A million perish among men.
When he plunders, the whole land rages,
Great and small roar;
People change according to his coming,
When Khnum has fashioned him.
When he floods, earth rejoices,
Every belly jubilates,
Every jawbone takes on laughter,
Every tooth is bared.

Food provider, bounty maker,
Who creates all that is good!
Lord of awe, sweetly fragrant,
Gracious when he comes.
Who makes herbage for the herds,
Gives sacrifice for every god.
Dwelling in the netherworld,
He controls both sky and earth.
Conqueror of the Two Lands,
He fills the stores,
Makes bulge the barns,
Gives bounty to the poor.



The Western Face of Friend's Mount, by Michael Jackson, 2016. Archival pigment print.

Grower of all delightful trees—
 He has no revenue;
 Barges exist by his might—
 He is not hewed in stone.
 Mountains cleave by his surge—
 One sees no workmen, no leader,
 He carries off in secrecy.
 No one knows the place he's in,
 His cavern is not found in books.
 He has no shrines, no portions,
 No service of his choice;
 But youths, his children, hail him,
 One greets him like a king.
 Lawful, timely, he comes forth,
 Filling Egypt, south and north;
 As one drinks, all eyes are on him,
 Who makes his bounty overflow.

From the Hymn to the Nile. Hapy was the personification of the annual Nile inundation, a crucial event for Middle Kingdom Egyptian agriculture; another text describes the "meadows laughing when the riverbanks are flooded." No formal temple cult existed for the deity, though he was greatly revered and usually depicted as an extremely fat man (or multiple men) with pendulous breasts—a sign of prosperity—and blue or green skin, wearing a belt suitable for a marsh dweller.

Poisoning the Well

"Among public utilities," wrote J. Edgar Hoover in 1941, "water-supply facilities offer a particularly vulnerable point of attack to the foreign agent due to the strategic position they occupy in keeping the wheels of industry turning and in preserving the health and morale of the populace."

Poisoner: Solon

Where: Cirrha, Greece, 586 BC

Strategy: During a siege of Cirrha, Athenian statesman Solon diverts the river that supplies water to the fortified city. When the Cirrhaeans make do by digging wells, Solon returns the river to its original course—after poisoning it with hellebore.

Aftermath: Cirrhaeans drink the better-tasting river water. Soon "seized with obstinate diarrhea," guards desert their posts and the Athenians storm the city.

Poisoners: Women of Galiffet Plantation

Where: Saint-Domingue, 1802

Strategy: Under the pretext of fetching water for French soldiers encamped on their plantation during the Haitian Revolution, enslaved women dump copper utensils into wells in solidarity with the revolutionaries.

Aftermath: Copper-heavy water makes the soldiers vomit blood, fall into comas, and die, "a mortality all the more alarming since no one knew where it came from," according to a French witness.

Poisoner: Tennessee Eastman Company

Where: Kingsport, Tennessee, 1941

Strategy: Developed as a "superexplosive," chemical compound RDX is manufactured in enormous quantities—up to 500 tons a day. Funded by the Department of Defense, production continues after WWII. Improperly stored RDX leaches into aquifers; by 2012 the plant dumps almost seventy pounds of the chemical into the Holston River every day.

Aftermath: Local communities see dramatic elevations in lung and breast cancers. The cost of cleanup has been estimated at \$70 billion.

Poisoner: Vitek Boden

Where: Maroochy Shire, Australia, 1999–2000

Strategy: After being rejected for a municipal job opening, Boden—a former sanitation technology worker—exact revenge by repeatedly hacking the radio-controlled sanitation system.

Aftermath: Over fourteen months Boden orchestrates forty-six dumpings of raw sewage, contaminating local parks, waterways, and businesses before being arrested.

Poisoner: Frederick I, Holy Roman Emperor

Where: Tortona, Italy, 1155

Strategy: When dumping "rotting and putrid corpses of men and beasts" into the city's water supply fails to end an insurrection, Frederick adds "burning torches with flames of sulfur and pitch" to render the water "useless for human needs," according to his biographer Otto of Friesing.

Aftermath: A few weeks later, "broken by fatigue from so many attacks and especially from thirst, and plunged into utter despair, the people of Tortona at last bargained for the surrender of their stronghold."

Poisoner: Confederate general Joseph E. Johnston

Where: Mississippi, 1863

Strategy: Hoping to slow the advance of Union troops following the Battle of Vicksburg, Johnston orders soldiers to herd cattle, hogs, and sheep into ponds used for drinking water, where the livestock is shot and left to rot.

Aftermath: Union general William T. Sherman notes in his memoirs that his men "had to haul their dead and stinking carcasses out to use the water."

Poisoner: Abbie Hoffman

Where: Chicago, 1968

Strategy: In the weeks leading up to the 1968 Democratic National Convention, rumors spread that the Yippies, led by Abbie Hoffman, are planning to dose Chicago's water supply with LSD.

Aftermath: Amused by the allegations, Hoffman refuses to deny them. Mayor Richard J. Daley orders armed guards to be stationed at city filtration plants.

Poisoner: Syrian president Bashar al-Assad

Where: Damascus, 2016

Strategy: Attempting to displace rebels camped around the al-Feijeh spring north of Damascus, the Syrian air force drops high-explosive bombs on it, leaving over five million civilians without reliable water for three months.

Aftermath: Assad's government claims that water service was stopped because rebels had poisoned the spring; video footage proves otherwise. In 2017 a UN commission declares the bombing a war crime.



1905: Yuma County, AZ

DRY COUNTY

The principal scene of the case is a typical *aguaje* (water) of southwestern Arizona, known as Tinajas Altas, or “High Tanks.” For the two half centuries during which California was a flourishing Mexican province, Tinajas Altas was reputed the sole sure “water” between Rio Sonoyta at Santo Domingo and Rio Colorado at Yuma on that desperately hard two-hundred-mile overland route known as El Camino del Diablo. Hardly a mile of it remains unmarked by one or more cruciform stone heaps attesting death by the wayside: death commonly in its cruelest form—by the torture of thirst.

Such was the site of my camp from May 20 to August 28. Just before noon of Monday, August 14, Pablo Valencia and Jesus Rios drifted into camp on horseback en route to the “lost mines” rediscovered by the former some months before. Next morning they got off at daybreak, about 3:45. Soon after midnight Jesus came in alone, reporting that Pablo had sent him back to rewater, he himself going forward on foot with a two-gallon canteen, under an agreement—an inane if not insane one in desert life—to rendezvous twenty-four to thirty hours later not on the trail but on the farther side of a nearby sierra. Jesus drank, ate, watered, fed, and struck the trail again. Next morning he again came in alone, reporting that his own animal had broken down after a short distance and that he had been unable to find either the lost man or his trail. I was convinced that further effort would be bootless, since Pablo had already been out over three days with only one day’s water.

On Wednesday, August 23, I awoke to find on the arroyo sands under an ironwood tree the wreck of Pablo. His itinerary, taken partly from his nearly meaningless maanderings as speech returned, runs thus:

Tuesday, August 15

Left Tinajas Altas at 3:45, horseback, with Jesus; rode some thirty-five miles, reaching “sand

hills” about one o’clock; thence afoot with two-gallon canteen (full at starting), pinole, tobacco, serape, duck coat, prospector’s hammer, canvas specimen bag, cigarette papers, and matches, faring some ten miles through the sands before stopping to sleep. Drank three or four times, and took pinole twice.

Wednesday, August 16

Starting with the rise of the morning star, reached the ledge of which he was in quest about midforenoon; after collecting specimens, erected monuments and posted notices for a mineral claim, finishing this work before midday. Ate a little pinole and drank sparingly (as he had done before starting), for the canteen was nearly empty. Starting northward, began search for a road described (falsely) by Jesus, and straggled rather aimlessly over the sands, moistening his mouth occasionally but not swallowing water, until the canteen was empty; at nightfall reached an arroyo in which he fancied signs of water. In the darkness of the early night (before moonrise) abandoned his nuggets, and soon after threw away his stock of pinole and his coat and serape. Failing to find water, he sought sleep in the sands; and when awakened by mouth dryness obtained some relief—after the fashion of all Mexicans and most Americans in like cases—by occasionally filling his mouth and gargling his throat with urine.

Thursday, August 17

Set out early, seeking trails and tinajas, and working northward; unable to withstand the heat of midday, he lay down in an arroyo and ate *calabasitas* (wild gourds of intense bitterness), which his stomach rejected. Arising as the sun declined, he threw away shoes and trousers (with money, knife, and tobacco in the pockets), and wandered on northward, finding occasionally old trails that either faded away in a few miles or else led into sands or impassable rocks—trails mostly figments of disordered fancy. One led to an immense tinaja; but it was dry. During the day he had frequent recourse to urine, though he nearly lost the power to swallow; during the



The Bath, Jávea, by Joaquín Sorolla y Bastida, 1905.

night he saved every drop of the excretion in the canteen, which he still carried.

Friday, August 18

Toward evening he arose and chewed paloverde twigs with little effect save to irritate mouth and throat. Setting out northward before sunset, he found a mescal (a variety of agave) and chewed the stipes, extracting a little moisture; at sunset he caught a few flies and spiders, which he chewed and tried to swallow. Toward morning he became convinced that Jesus had deliberately misled and abandoned him with murderous intent in the plan of thus securing his El Dorado; and his wrath spurred him on with the aim of knifing his deceiver—a potent incentive that carried him miles and doubtless saved his life. He continued to relieve mouth thirst with urine.

Saturday, August 19

In early morning he found mule-wagon tracks and recognized the Old Yuma Trail, which he followed, but soon fell under the heat and lay

all day in an arroyo. In the afternoon he saw one of the large light-green scorpions of the region; it looked luscious, and he captured it, ground off its sting with a stone, and devoured it. As before, he used urine, swallowing a part with great difficulty. Toward evening he resumed journeying northward, often falling; near morning he found (or thought he found) Jesus' trail where he had wandered in search of the hopeless rendezvous set for the sixteenth. Throughout the night he caught occasional glimpses of a coyote trailing him. During all of Saturday and throughout this night on the trail, he was buoyed by a new incentive—the hope of reaching Tule Well and casting himself into the moist mud at its bottom and at the worst dying in the dampness and coolness thirty-seven feet below ground; he felt the notion half-insane and the hope wholly hopeless, yet unto them he clung as to an inspiration. Meantime, he constantly sought insects to chew and continued using his urine, now “*mucho malo*” (very bad).

Sunday, August 20

In early morning he pushed on westward, often sitting down, sometimes falling, and tried crawling—with little success. His vision was vague; the mountains danced, and the cactus and chaparral clumps moved to and fro before his eyes. After creeping to one or two tinajas—known to him of old—which he found dry, he lay all day in the shade of the rocks, using every drop of urine, which now dripped scantily and involuntarily. Toward evening he again bethought himself of Jesus and the pleasure of knifing him and was inspired to further effort; but he fell so often as he struggled forward that he was only at a remembered campsite three and a half miles west of Tule Well when day broke again.

Monday, August 21

On reaching at dawn the campsite, only nineteen miles from Tinajas Altas, he felt sure of relief and stretched himself across the trail so as not to be missed by rescuers—there he dozed and slept, starting up frequently at fancied sounds of wheels and hooves; the buzzards, which had followed him for two days, now came almost within hand reach. The sleep and coolness (only 91 degrees) of the day and the short distance traversed the night before had their effect; he felt stronger, and toward sunset he set out again westward along the trail, buoyed by the certainty of at least finding full canteens (of which Jesus had indeed left two, at impossible places). He often thought he saw Tinajas Altas with abundant water and food just before him, yet was not wholly cast down on feeling a landmark he knew to be miles away; so he made, with many rests and naps, twelve miles.

Tuesday, August 22

In early dawn his mind was reaching out buoyantly to Tinajas Altas as but a few steps away, when he half saw, and then fully felt all over, the six-mile guidepost (about seven miles from camp), and awoke to the sad certainty that no canteen hung there, and the still more crushing realization that he could not cover the remaining miles of sand—for his urine had ceased to flow

hours before, and he felt his last recourse gone. As the sun rose, he sought the shade of a shrub and there knelt in final prayer for the dying; then he laid himself down with feet and face to the eastward, made the sign of the cross with a pang over the absence of consecrated water, and composed himself for the end. There—and this was his clearest concept, unreal though it be—with the rising of the sun he died, and his body lay lifeless under the burning rays, though his innermost self hovered about, loath to leave the material husk about which the buzzards waited patiently. The sun swung across the shimmering vault, and darkness fell; in the chill of evening (fortunately an exceptionally cool night—just above 82 degrees) some vague shadow external to his ego stirred and then struggled aimlessly against chaparral and cactus along the most trying stretch of El Camino del Diablo. Sometimes he felt half-alive and wrung by agony of severing spirit and flesh; oftener he felt that the naked body was pushed and dragged and belabored and tortured by something outside; he knew its voice tried to cry out in protest or call for rescue but did not feel the voice his own. So the night dragged on and on, until at early dawn the vague consciousness knew itself near the camp with the certainty of relief, and was dimly surprised at the bellowing break in a final call.

Wednesday, August 23

After uttering this call, he crawled some fifty yards down the last descent to the arroyo below the Mesa of the Forty Graves. Of this day, with its physical shock and psychical break, Pablo remembered nothing clearly.

W.J. McGee, from "Desert Thirst as Disease." Pablo lost up to forty pounds but survived this ordeal. McGee spent a decade conducting geological surveys for the U.S. government before being hired in 1893 to run the newly formed Bureau of American Ethnology. He was one of the first researchers to study the southwestern corner of the Arizona Territory. Elsewhere he writes of Death Valley as a place where "thirst abides," in which "the 'last water' and 'next water' are ever present and dominant ideas." In 1906, a year after Valencia's experience, McGee delivered this paper—which describes five "phases of thirst"—to a group of Missouri doctors.

C. 1280: Yangtze River

RIVERS RUN THROUGH IT

After heading west for twenty days, the traveler comes to a plain and a province called Chengdufu that lies on the borders of Manzi. The capital, which is likewise called Chengdufu, used to be a very great and noble city. Now you should know that several large rivers run through this city, carrying the freshwater that flows down from the distant mountains and providing excellent fishing. These rivers encircle the city and branch across it in various directions. They range in width from half

*People who live
by rivers
dream
they are immortal.*

—Audre Lorde, 1974

a mile to 200 paces, 150 paces, or more or less, but they are all very deep. Spanning them are countless stone bridges, all very large and splendid, each eight paces wide and varying in length according to the width of the rivers. These bridges are flanked along either side by fine marble columns that support the roof. All these bridges are protected by magnificent wooden roofs, marvelously decorated and painted in red and topped with tiles. From one end to the other, the bridges are lined with exquisite little booths and stalls where all manner of trades and crafts are practiced. I can tell you that they are made from poles which are delivered in the morning and taken away every evening. Then there is the emperor's customhouse where his dues are collected, namely the duty on goods sold on the bridge. And I assure you that the duty taken on these bridges amounts to no less than a thousand gold bezants.

As these rivers flow out of the city, they join together to form a vast river named Yangtze that runs on for eighty or a hundred days' journey all the way to the ocean. There are

countless cities and towns along its banks. There are ships so huge—that is, in such huge numbers—that no man who had not seen them with his own eyes would ever credit it. It is so vast, this swarm of river traffic, together with the great profusion of rich merchandise that merchants carry up and down this river, that there is not a man in the world who would believe it without seeing it. The river itself is so broad that it is not so much like a river as a sea.

Now you should know that when the traveler sets out from the city of Chengdufu and continues on the Yangtze, he reaches a city called Zhenzhou [now Yizheng]. It is by no means very large but is a great center of shipping and trade. The people are idolaters and are subject to the Great Khan. They have paper money. At some points the Yangtze is ten miles wide, at others eight, and at others six; it is more than 120 days' journey in length. Countless rivers flow into it from every direction, all of them navigable and each enlarging and swelling it in turn. And on account of this river, this city has an exceptionally large fleet of boats for transporting merchandise and items of all kinds along the river. Consequently, it is a city that yields substantial revenues and taxes to the Great Khan.

Moreover, let me tell you that this river runs for such a distance, crosses so many regions, and has so many cities on its banks that I swear the number of boats that sail it—and the quantity and value of their precious wares—exceeds that of all the rivers of Christendom put together, and all the seas to boot. For I give you my word that I have seen no fewer than fifteen thousand boats in this city at the same time, all afloat on this river. You can well imagine, given that this city of no great size has so many ships, how many there must be in the others. For I assure you that this river flows through more than sixteen provinces, and there are more than two hundred cities on its banks, all with bigger fleets than this one. This does not include the cities and districts on the rivers that flow into the main stream, which also have a great deal

of shipping. And all of these ships bring merchandise to this city of Zhenzhou and take more merchandise back with them. The chief article of trade on this river is salt, which merchants load in this city and carry to all the regions bordering the river as well as further upcountry, leaving the main river and sailing up its tributaries to supply all the surrounding districts. For this reason, salt is brought to this city of Zhenzhou from all points along the seashore, and here it is put aboard ships and carried throughout these regions. The same ships also carry iron. On their return journey downstream, they bring to this city wood, charcoal, hemp, and many other articles that

are supplied to the regions near the seashore. Believe it or not, there is not enough shipping to carry everything, and many goods are transported on rafts. And this is why this port or city provides the Great Khan with such a hefty income.

Marco Polo, from his *Travels*. When Polo arrived with his father in Chengdufu, the capital of Sichuan province, around 1287, China was the world's technological leader. Seven hundred years earlier—with the work of more than three million conscripted laborers—the Sui dynasty had completed the thousand-mile Grand Canal linking the Yellow and Huai Rivers, ultimately part of a thirty-thousand-mile-long waterway system that allowed rice to be moved from paddies in southern China to cities in the north.

Venice, from the *Porch of Madonna della Salute*, by J.M.W. Turner, c. 1835.



1770: Bath

GERM BATH

Dear Dick,

I have done with the waters; therefore, your advice comes a day too late. I grant that physic is no mystery of your making. I know it is a mystery in its own nature and, like other mysteries, requires a strong gulp of faith to make it go down. Two days ago, I went into the King's Bath, by the advice of our friend Ch——, in order to clear the strainer of the skin, for the benefit of a free perspiration; and the first object that saluted my eye was a child full of scrofulous ulcers carried in the arms of one of the guides under the very noses of the bathers. I was so shocked at the sight that I retired immediately with indignation and disgust. Suppose the matter of those ulcers, floating on the water, comes in contact with my skin when the pores are all open, I would ask you what must be the consequence? Good heaven, the very thought makes my blood run cold! We know not what sores may be running into the water while we are bathing, and what sort of matter we may thus imbibe; the king's evil, the scurvy, the cancer, and the pox; and, no doubt, the heat will render the virus the more volatile and penetrating. To purify myself from all such contamination, I went to the Duke of Kingston's private bath, and there I was almost suffocated for want of free air; the place was so small and the steam so stifling.

After all, if the intention is no more than to wash the skin, I am convinced that simple element is more effectual than any water impregnated with salt and iron, which, being astringent, will certainly contract the pores and leave a kind of crust upon the surface of the body. But I am now as much afraid of drinking as of bathing; for after a long conversation with the doctor about the construction of the pump and the cistern, it is very far from being clear with me that the patients in the pump room don't swallow the scourgings of the bathers. I can't help suspecting that there is, or may be, some regurgitation from the bath into the

cistern of the pump. In that case, what a delicate beverage is every day quaffed by the drinkers, medicated with the sweat and dirt and dandruff and the abominable discharges of various kinds from twenty different diseased bodies parboiling in the kettle below. In order to avoid this filthy composition, I had recourse to the spring that supplies the private baths on the abbey green; but I at once perceived something extraordinary in the taste and smell, and upon inquiry, I find that the Roman baths in this quarter were found covered by an old burying ground belonging to the abbey, through which, in all probability, the water drains in its passage, so that as we drink the decoction of living bodies at the pump room, we swallow the strainings of rotten bones and carcasses at the private bath. I vow to God, the very idea turns my stomach! Determined, as I am, against any farther use of the Bath waters, this consideration would give me little disturbance if I could find anything more pure, or less pernicious, to quench my thirst; but although the natural springs of excellent water are seen gushing spontaneous on every side from the hills that surround us, the inhabitants, in general, make use of well water so impregnated with niter or alum or some other villainous mineral that it is equally ungrateful to the taste and mischievous to the constitution. It must be owned, indeed, that here, in Milsham Street, we have a precarious and scanty supply from the hill, which is collected in an open basin in the Circus, liable to be defiled with dead dogs, cats, rats, and every species of nastiness, which the rascally populace may throw into it from mere wantonness and brutality.

Well, there is no nation that drinks so hoggishly as the English.

Tobias Smollett, from *The Expedition of Humphry Clinker*. The Scottish author of picaresque novels also held a medical degree and served as a surgeon's second mate in the British navy. Nearly twenty years before he questioned the medicinal properties of the waters at Bath in Humphry, Smollett published *"An Essay on the External Use of Water,"* in which he disavowed the benefits of the Bath Corporation's sulfuric waters. The corporation showed little interest in making his suggested improvements.



Beneficent Rain, detail of a handscroll by Zhang Yucui, late thirteenth or early fourteenth century.

1961: Paris

WATER CURE

The use of water immersion goes back a long way in the history of madness. The baths practiced at Epidaureus would be proof enough of that, but cold applications of all varieties must have been common currency in the classical world if Caelius Aurelianus is to be believed. During the Middle Ages, it was traditional to plunge maniacs into the water several times, “until they had lost their strength and forgotten their fury.” From the end of the seventeenth century onward, the cure by baths was, or was once more, the most common form of treatment for insanity.

The importance accorded to water is evident in medical practices dominated by a concern with balancing liquids and solids. For if it had powers of impregnation that placed it in the first rank of humectants, water could also transmit supplementary qualities like heat and cold, and virtues of constriction, refreshment, and heat, and thus possessed the consolidating effects associated with bodies like iron. In fact, in the fluid substance of water, the game of qualities was highly labile, and just as easily as it penetrated the weave of tissues, it allowed itself to be impregnated with all the qualitative influences to which it was subjected. Paradoxically, the universality of its use in the eighteenth century was not a result of the widespread rec-

ognition of its effects and its mode of action but of the ease with which the most contradictory forms could be attributed to that effectiveness. In water, all possible therapeutic themes met, forming an inexhaustible reserve of operative metaphors. It is in this fluid element that the universal exchange of qualities could take place.

Naturally, cold water cooled. For that reason it was used in mania and frenzy, sicknesses of heat where the spirits were in ebullition, solids tightened, and liquids were heated to the point of evaporation, leaving the brain of the patient “dry and brittle,” as anatomists regularly demonstrated. But it was also said that cold water brought heat and that hot water cooled. Cold baths chased the blood from the periphery of the body and pushed it “with increased vigor toward the heart.” As the heart was the seat of natural heat, the blood was warmed there.

A symmetrical paradox operated regarding hot baths: blood was attracted to the extremities of the body, as were the humors, sweat, and all forms of liquid, both beneficial and harmful. The vital centers were therefore deserted, the heart slowed, and the organism thus began to cool down. This fact was confirmed by the “fainting, lipothymia, weakness, nonchalance, lassitude, and lack of vigor” that generally accompanied excessive bathing with hot water.

But there was more. So great was the polyvalence of water, so great was its aptitude to submit itself to the qualities that it carried,

that it sometimes lost its efficacy as a liquid and acted as a desiccant instead. Water could prevent dampness. For some it was cold water that brought dryness, as heat kept water humid. Heat dilated the pores of the organism, distended its membranes, and allowed humidity to impregnate them as a secondary effect.

In cold water the low temperature was more important than the power of humidity because, by forcing the tissues to contract, it prevented the possibility of impregnation. Cold baths therefore had the paradoxical property of consolidating the organism and fortifying it against the softness brought by moisture.

What water gives, water takes away.

—Portuguese proverb

But the relationship was reversed in other qualitative intuitions. Then it was heat that checked the humidifying properties of water, whereas cool maintained them and renewed them ceaselessly. Against the sicknesses of the nerves due to “shriveling of the nervous tissue” and “dryness of the membranes,” the French physician Pierre Pomme did not recommend hot baths, as they encouraged the heat that reigned in the body; but warm or cold, they were capable of penetrating the tissues of the organism and returning them to their natural suppleness. This was the method that was practiced quite spontaneously in America. Its effects and even its mechanism were quite discernible to the naked eye, as the cure progressed, as when the crisis reached its highest intensity, patients floated to the top of the water in their bath, so much had the internal heat rarefied the air and the liquid in their bodies; but if they remained too long in the water, “three, four, or even six hours per day,” then relaxation followed, water progressively impregnated the membranes and fibers, the body grew heavier and naturally sank down to the bottom of the water.

At the end of the eighteenth century, the power of water began to wane as a result of this excess of natural qualities. So varied were

its modes of action, it could be used to affirm or deny almost anything. That polyvalence, of course, and the discussions to which it gave rise, were ultimately its neutralization. By the time of French physician Philippe Pinel, water cures were still practiced, but the element had become again entirely transparent. Water was cleansed of all its qualitative charges, and its action had become purely mechanical.

The shower, which until this point had been less employed than baths, then took over as the preferred technique. Paradoxically, after all the physiological variations of the preceding era, water once again reverted to its simple function of purification. The only quality it was now credited with was violence, washing away in an irresistible flow all the impurities that formed madness. Its curative force reduced individuals to their most simple expression, their purest form of existence, and so brought a kind of second birth. To Pinel’s mind, this was a matter of “destroying even the primitive traces of the eccentric ideas of the insane...this can only take place by reducing such ideas to a state, so to speak, close to death.” This led to the infamous techniques used in asylums like Charenton at the end of the eighteenth and the start of the nineteenth centuries. In the cold shower proper, “the lunatic was tied to a chair and placed under a reservoir filled with cold water, which poured down directly onto his head through a wide pipe.” The variant was the surprise bath, where “the patient was taken down the corridors to the ground floor, and arrived in a square room with a vaulted ceiling, where a large bath had been constructed; he was then tipped backward into the water.” This violence promised the rebirth of a baptism.

Michel Foucault, from *History of Madness*. According to British psychiatrist R.D. Laing, the thesis advanced by Foucault in this 1961 work “thoroughly shakes the assumptions of traditional psychiatry.” French physicians had become increasingly interested in finding a cure for madness, relying on consolidation, purification, immersion, and regulation of movement. Five years later, in 1965, Foucault published *The Order of Things*, in which he wrote, “Marxism exists in nineteenth-century thought like a fish in water: that is, it is unable to breathe anywhere else.”

C. 170: Hades

DYING FOR A DRINK

Menippus: Why are you crying, Tantalus? Why do you stand beside the lake lamenting your lot?

Tantalus: Because, Menippus, I'm dying of thirst.

Menippus: Are you too lazy to bend your head down and drink, or even, bless us, to scoop the water up with your palm?

Tantalus: It's no good bending down; the water runs away as soon as it feels me coming near, and if ever I do scoop up any and bring it to my mouth, I can't wet the tip of my lips before it runs through my fingers somehow and leaves my hand dry as before.

Menippus: You're the victim of a miracle, Tantalus. But tell me, just why do you need to drink? You have no body, for that's been buried in Lydia. That could feel hunger and thirst. But you are a ghost; how can you still be thirsty or able to drink?

Tantalus: It's just that that's my punishment—that my ghost should be thirsty as if it were a body.

Menippus: Well, we'll believe it, since you tell us you're punished by thirst. But what do you find so terrible in that? Are you afraid of dying for lack of drink? I can't see another Hades after this one, or a death hereafter taking us elsewhere.

Tantalus: You are quite right. But this is part of my sentence—to long to drink when I have no need.

Menippus: Nonsense, Tantalus. I think you really do need a drink—neat hellebore, so help me. You're the opposite of people bitten by mad dogs; you don't fear water, but you do fear thirst.

Tantalus: I don't mind drinking even hellebore—I only wish I could have some.

Menippus: Don't worry, Tantalus, for neither you nor any other dead man will drink; that's impossible. However, they've not all been condemned to thirst, as you do, for water which won't wait for them.

Lucian, from *Dialogues of the Dead*. *Apprenticed to a sculptor in his native Samosata, Lucian became a successful rhetorician in Greece, Italy, and Gaul before beginning a writing career in Athens around 160. Though not initially as popular as his other works, his thirty satirical dialogues set in Hades became a model for Renaissance humanist writers and would inspire similar works throughout the Enlightenment and beyond. More than seven hundred such writings were produced in eighteenth-century Germany alone.*

Li Wei Falls to Hong Kong, by Li Wei, March 14, 2006.





North Pacific Ocean, Ohkurosaki, by Hiroshi Sugimoto, 2013.

1958: São Paulo

TRICKLE-DOWN ECONOMICS

June 8

All I know is, whatever is cursed, the *favelado* [favela resident] gets. When we moved into the favela, we went to ask for water from the brick houses. Dona Ida Cardoso gave us water. Thirteen times she gave us water. She told us she'd give us water only on weekdays; on Sunday she wanted to sleep late. The favelado is not a donkey, but he was vaccinated with donkey's blood. One day they went to get water and didn't find the public spigot turned on. So they formed a line at the door of Dona Ida and everybody shouted, "I want water for the baby's bottle. My God, what are we going to do without water?"

They went to other houses, beating on the doors. Nobody answered. Nobody showed up to wait on them, so as not to listen to: "Could you give us a little water?"

I carried water from Guaporé Street from the place where I sell paper. Others carried water from the Social Service in bottles.

One Tuesday afternoon Dona Ida's mother-in-law was sitting resting and she said, "Somebody should send a flood to wipe away the favela and kill those nuisances. There are times when I'm furious with God for putting poor people on earth. All they do is annoy others."

Tina, Dona Mulata's daughter, when she heard of this, said, "If anyone should die drowning, it should be her!"

In the flood of 1949, Pedro Cardoso died. He was Dona Ida's son. When I heard that little Pedro had died by drowning, I thought

of the disappointment his grandmother must have had asking for water, water, enough water to kill the favelados and then seeing water kill her grandson. It was for her to understand that God is temperate. He is the lawyer of the humble. The poor are creatures of God. And money is a metal created and valued by man. If God had warned Dona Ida that if she didn't give us water she would lose her child forever, I believe she would be giving us water until today.

June 9

I was lying down when I heard children's voices shouting they were showing a free movie in the street. I didn't believe what I heard and decided to go and see. It was the health department. They came to show a film to the favelados on how snails transmit anemic disease. They told us not to use the river water. That young snails grow up in that water. Even the water...instead of helping us, it contaminates us. Not even the air we breathe is pure, because they throw garbage here in the favela. They asked the favelados to build bathrooms!

June 11

It's now six months that I haven't paid for water at twenty-five cruzeiros a month. Speaking of water, I don't like, and have a fear of, going for water. When the women conglomerate at the spigot, when they're waiting their turn to fill their cans, they talk of everybody and everything. If a woman is getting fat, they say she's pregnant. If she's losing weight, they say she has tuberculosis.

July 4

I soaped the clothes. Then I went to finish washing them in the lagoon. The State Health Department has said that the water of the lagoon transmits a snail's disease. They come and tell us what we try to ignore. They leave us with the polluted lagoon and do nothing about supplying us with good water.

July 11

I got out of bed at five thirty. I was tired from writing and sleepy. But here in the favela you

can't sleep, because the shacks are humid and Neide coughs a lot and keeps me awake. I went to get water and the line was enormous. What an unpleasant thing to wait at that spigot. There's always a fight or someone who wants to know all about the private life of another. In the morning the area around the spigot is covered with shit. I am the one who cleans it up. Because the others aren't interested.

July 17

Leila and Arnaldo fought all night. They didn't let us sleep. I got out of bed at five thirty and carried water. At the spigot there's always a row.

"You went in front of me!"

"I did not!"

And so it goes. One day Dona Silvia's husband, Antonio, was at the spigot and arguing, he and a *nortista*. While they were trading insults, I arrived. The *nortista* took out his knife. Antonio is sixty-five years old, but when he saw that knife, he gave a jump equal to Adhemar Ferreira doing the triple jump in the Olympics.

August 28

I went to get water. What a line! When I saw the line of cans, I became depressed with life. I left my cans in line and went back to make some coffee. I woke João. He washed himself and went out to buy bread. I washed the dishes and disinfected José Carlos. I changed his clothes and gave him coffee. Then they went to school. I went back to the spigot. There were some arguments because some had tried to get ahead of the others.

October 22

Orlando came to collect for the water, twenty-five cruzeiros. He told me that nobody was permitted to be late with a payment. Orlando lives doing odd jobs. Now that he has become the one in charge of light and water, he's stopped working. In the morning he sits at the spigot giving his opinions. I thought: he'll lose because the tongue of a woman in the favela is acid. It's not bone, but breaks bones.



Water personified as the Roman goddess Venus, engraving by Adriaen Collaert after Maerten de Vos, c. 1582.

January 5, 1959

It's raining. I am almost crazy with the dripping on the beds because the roof is covered with cardboard and the cardboard is rotten. The water is rising and invading the yards of the favelados. I got out of bed at four AM, turned on the radio, and went for water. What a torture it is to walk in water in the morning. And I catch cold so easily! But life is like that. Men are leaving for work. They are carrying their shoes and socks in their hands. Mothers keep the children inside the house. They get restless because they want to go out and play in the water. People with a sense of humor say that the favela is a sailors' city. Others say it is the São Paulo Venice.

June 29

Today I woke up hoarse. It was four AM when I went to get water because that Orlando Lopes said he wouldn't let me get water anymore. I

put water on to make coffee. I only have eighteen cruzeiros! I am so unhappy! If I could only move out of this favela! This place is the work of the devil. Wicked men have lived here, but that Orlando tops them all.

August 4

It dawned raining. I made coffee and sent João to buy fifteen cruzeiros of bread. I borrowed the fifteen from Adalberto. I didn't go for water. I'm sick of standing in that disgusting line.

Carolina Maria de Jesus, from her diary. After moving to a favela with her children around 1948, Carolina Maria de Jesus—who completed no more than two years of formal schooling in her home state of Minas Gerais—began to keep a diary using paper salvaged from discarded notebooks. In 1958 she met a reporter who arranged to publish excerpts in a newspaper, which led to the full publication of her diary in 1960. Although the royalties finally gave her the means to move out of the favela, she died in poverty in 1977.

1894: Lourdes

IMMERSION THERAPY

In addition to the patients and the *hospitaliers* selected for duty at the grotto's pools, the only person in the little dressing room was a chaplain who kept on repeating *Paters* and *Aves*, for not even a momentary pause was allowed in the prayers. Merely a loose curtain hung before the doorway leading to the open space that the rope enclosed. The ardent, clamorous entreaties of the throng were incessantly wafted into the room, with the piercing shouts of the Capuchin, who ever repeated, "Lord, heal our sick! Lord, heal our sick!" A cold light fell from the high windows of the building, and constant dampness reigned there, with the moldy smell like that of a cellar dripping with water.

At last M. Sabathier, an invalid who had lost the use of his legs, was stripped, divested of all garments save a little apron that had been fastened about his loins for decency's sake.

"Pray don't plunge me," he said. "Let me down into the water by degrees."

In point of fact, that cold water quite terrified him. He was still wont to relate that he had experienced such a frightful chilling sensation on the first occasion that he had sworn never to go in again. According to his account, there could be no worse torture than that icy cold. And then, too, as he put it, the water was scarcely inviting; for through fear lest the output of the source should not suffice, the fathers of the grotto allowed the water of the baths to be changed only twice a day. And nearly a hundred patients being dipped in the same water, it can be imagined what a terrible soup the latter at last became. All manner of things were found in it, so that it was like a frightful consommé of all ailments, a field of cultivation for every kind of poisonous germ, a quintessence of the most dreaded contagious diseases, the miraculous feature of it all being that men should emerge alive from their immersion in such filth.

"Gently, gently," repeated M. Sabathier to Father Pierre and the Marquis de Salmon-

Roquebert, who had taken hold of him under the hips in order to carry him to the bath. And he gazed with childlike terror at that thick, livid water on which floated so many greasy, nauseating patches of scum. However, his dread of the cold was so great that he preferred the polluted baths of the afternoon, since all the bodies that were dipped in the water during the early part of the day ended by slightly warming it.

"We will let you slide down the steps," exclaimed the marquis in an undertone; and then he instructed Pierre to hold the patient with all his strength under the armpits.

Instead of drinking Coca-Colas, turn on the tap and drink what the good Lord gave us.

—Edwina Currie, c. 1988

"Have no fear," replied the priest. "I will not let go."

M. Sabathier was then slowly lowered. You could now only see his back, his poor painful back that swayed and swelled, mottled by the rippling of a shiver. And when they dipped him, his head fell back in a spasm, a sound like the cracking of bones was heard, and breathing hard, he almost stifled.

The chaplain, standing beside the bath, had begun calling with renewed fervor, "Lord, heal our sick! Lord, heal our sick!"

M. de Salmon-Roquebert repeated the cry, which the regulations required the hospitaliers to raise at each fresh immersion. Pierre, therefore, had to imitate his companion, and his pitiful feelings at the sight of so much suffering were so intense that he regained some little of his faith. It was long indeed since he had prayed like this, devoutly wishing there might be a God in heaven, whose omnipotence could assuage the wretchedness of humanity. At the end of three or four minutes, however, when with great difficulty they drew M. Sabathier, livid and shivering, out of the bath, the young priest fell into deeper, more despairing sorrow than ever at beholding how downcast,

how overwhelmed the sufferer was at having experienced no relief. Again had he made a futile attempt; for the seventh time the Blessed Virgin had not deigned to listen to his prayers. He closed his eyes, from between the lids of which big tears began to roll while they were dressing him again.

Father Fourcade and Father Massias, suddenly arriving, gave orders to suspend the immersions. A great miracle was about to be attempted—the restoration of a dead man to life. Two bearers came in with a covered stretcher, which they deposited in the middle of the dressing room.

*Seek not water, only show you are thirsty,
That water may spring up all around you.*

—Rumi, c. 1260

The curtains of the stretcher were raised, and the man's corpse appeared, already stiff, and seemingly reduced and shrunken, with large eyes that had obstinately remained wide open. Pierre noticed that the Marquis de Salmon-Roquebert, who showed such devotion to the living, such freedom from all repugnance whenever they were in question, had now drawn aside and fallen on his knees, as though to avoid the necessity of touching that lifeless corpse. And the young priest thereupon followed his example and knelt near him in order to keep countenance.

Making an effort, the two hospitaliers now raised the man by means of the straps, carried him to the bath, and slowly lowered him into the water, at each moment fearing he would slip away from their hold. Pierre, although overcome by horror, could not do otherwise than look at them, and thus he distinctly beheld the immersion of this corpse in its sorry garments, which on being wetted clung to the bones, outlining the skeleton-like figure of the deceased, who floated like a man who has been drowned. But the repulsive part of it all was, that in spite of the rigor mortis, the head fell backward into the water and was submerged by it. In vain did the hospitaliers try to raise it by pulling the shoulder

straps; as they made the attempt, the man almost sank to the bottom of the bath. And how could he have recovered his breath when his mouth was full of water, his staring eyes seemingly dying afresh beneath that watery veil?

Then, during the three long minutes allowed for the immersion, the two fathers of the Assumption and the chaplain, in a paroxysm of desire and faith, strove to compel the intervention of heaven, praying in such loud voices that they seemed to choke.

"Do thou but look on him, O Lord, and he will live again! Lord! May he rise at thy voice to convert the earth! Lord! Thou hast but one word to say and all thy people will acclaim thee!"

At last, as though some vessel had broken in his throat, Father Massias fell groaning and choking on his elbows, with only enough strength left him to kiss the flagstones. And from without came the clamor of the crowd, the ever-repeated cry, which the Capuchin was still leading: "Lord, heal our sick! Lord, heal our sick!" This appeal seemed so singular at that moment that Pierre's sufferings were increased. He could feel, too, that the marquis was shuddering beside him. And so the relief was general when the overseer, thoroughly annoyed with the whole business, curtly shouted to the hospitaliers, "Take him out! Take him out at once!"

The body was removed from the bath and laid on the stretcher, looking like the corpse of a drowned man with its sorry garments clinging to its limbs. The water was trickling from the hair, and rivulets began falling on either side, spreading out in pools on the floor. And naturally, dead as the man had been, dead he remained.

Émile Zola, from Lourdes. *The holy waters at Lourdes were discovered by fourteen-year-old Bernadette Soubirous, who reported seeing an apparition of the Virgin Mary there in 1858. Zola, whose naturalist work was inspired by developments in the social and natural sciences, visited in 1891 and 1892 and was skeptical of the waters' claimed healing power; when Lourdes first appeared in English translation in 1906, one critic described it as "an open wound." According to the Catholic Church, sixty-nine cures have been verified as miracles by the Lourdes Medical Bureau since Bernadette's visions.*



River god and two nymphs, fresco from the House of the Vestals, Pompeii, c. 75.

c. 1230: Benediktbeuern

WATER V. WINE

'Tis the naked truth, I warrant,
Two things mutually abhorrent
 Never should be joined in one;
Since the rule, most briefly stated,
Is to keep them separated,
 That should certainly be done.

When by any hand benighted
Wine and water are united,
 Then the wine cup is abused;
Not a trace of real communion
Marks that base and praiseless union,
 'Tis confusion twice confused.

Wine, perceiving Water's closeness,
Crossly cries, "How dares your grossness
 Intermix itself with me?
Up, get out, be off, get moving,
This is not a place behooving
 Trash the like of you to be.

"Vile and shameless are you surely,
Slinking from the world obscurely
 Into holes and cracks you flood;

Or aboveground, when you're trodden,
Earth combined with you grows sodden,
 So you change yourself to mud.

"Not by you are banquets brightened,
Not by you is converse lightened,
 All is silence when you come;
Fill with water the decanter
And the best of jokes and banter
 Die away and men are dumb.

"Water drinking's an unfailing
Way to make a well man ailing;
 All his inwards go awry:
Bowels groan with wind insurgent,
Which, confined and not emergent,
 Causes many an anguished sigh."

Water held the speaker blameful:
"You are he whose life is shameful,
 You the root of wretchedness;
They who find your cup delicious
Turn from virtuous ways to vicious,
 Plunge their lives in deep distress.

"Fearing evil, man deposits
All he has of you in closets,
 Keeps you under lock and key.

Through the world I'm free to travel,
Permeating soil and gravel
Till the earth is soaked in me.

"Hear a truth that's most instructive:
Fields become through me productive,
Everything is fresher made;
While if rain is scant, the tillage
Yields no harvest to the village,
Flower and leaf, the lilies fade.

"Then the twisted vine, your mother,
Bears no fruit, nor could another;
Barren all the vineyard stands;
Half-denuded of her tresses
Closely to the ground she presses,
Dry and stiff, with empty hands.

"Hunger stalks when I am lacking;
Drought will send the people packing
Round the altars to complain,
There will Hebrew, Christian, pagan,
To Jehovah, Christ, or Dagon
Pray incessantly for rain."

Wine replied, "You do keep harping
On your worth, and call me carping
When another side I show;
Yet the whole wide world bears witness
To your vileness and unfitness:
We believe but what we know.

"You absorb, by way of riddance,
Bilge from privies, drains, and middens,
Many nameless filths as well,
Nasty droppings, waste, offscourings,
Poisonous drenches and outpourings
More than I would care to tell."

Water, hearing this, astounded
Burst in tears and stood dumbfounded,
Heaving many a bitter sigh.
Wine exulted: "You're confuted?
Now at last your tongue is muted,
Not a word can you reply."

I who wrought this disputation
Here, by way of termination,
Say to people all and some:
Watering wine, if you abet it,
May Christ cause you to regret it
Now and for all time to come.

From the Carmina Burana. Discovered in a Bavarian abbey in 1803, the text known as the Carmina Burana consists of more than two hundred songs, poems, and passion plays compiled and written down around 1230 but dating to as early as the tenth century. With subjects ranging from drinking and erotic love to satirical visions of the church, the verses were the work of goliards, a class of scholar-singers who wandered western Europe. Though the verses were originally sung, much of the recorded musical notation remains undeciphered.

Moses Striking Water from the Rock, by Jacob Jordaens, c. 1645.



c. 1880: Colombia

HEALTH-CARE REFORM

Dr. Juvenal Urbino did not sleep at all on the night of his return from Paris; he was frightened by the darkness and the silence, and he said three rosaries to the Holy Spirit and all the prayers he could remember to ward off calamities and shipwrecks and all manner of night terrors, while a curlew that had come in through a half-closed door sang every hour on the hour in his bedroom. He was tormented by the hallucinating screams of the madwomen in the Divine Shepherdess Asylum next door, the harsh dripping from the water jar into the washbasin that resonated throughout the house, the long-legged steps of the curlew wandering in his bedroom, his congenital fear of the dark, and the invisible presence of his dead father in the vast, sleeping mansion. When the curlew sang five o'clock along with the local roosters, Dr. Juvenal Urbino commended himself body and soul to divine providence because he did not have the heart to live another day in his rubble-strewn homeland. But in time the affection of his family, the Sundays in the country, and the covetous attentions of the unmarried women of his class mitigated the bitterness of his first impression. Little by little he grew accustomed to the sultry heat of October, to the excessive odors, to the hasty judgments of his friends, to the We'll see tomorrow, Doctor, don't worry, and at last he gave in to the spell of habit. It did not take him long to invent an easy justification for his surrender. This was his world, he said to himself, the sad, oppressive world that God had provided for him, and he was responsible to it.

The first thing he did was to take possession of his father's office. He kept in place the hard, somber English furniture made of wood that sighed in the icy cold of dawn, but he consigned to the attic the treatises on viceregal science and romantic medicine and filled the bookshelves behind their glass doors with the writings of the new French school. He took down the faded pictures, except for the one of the physician ar-

guing with Death for the nude body of a female patient, and the Hippocratic oath printed in Gothic letters, and he hung in their place, next to his father's only diploma, the many diverse ones he himself had received with highest honors from various schools in Europe.

He tried to impose the latest ideas at Misericordia Hospital, but this was not as easy as it had seemed in his youthful enthusiasm, for the antiquated house of health was stubborn in its attachment to atavistic superstitions, such as standing beds in pots of water to prevent disease from climbing up the legs, or requiring

Can you draw sweet water from a foul well?

—Brooks Atkinson, 1940

evening wear and chamois gloves in the operating room because it was taken for granted that elegance was an essential condition for asepsis. They could not tolerate the young newcomer's tasting a patient's urine to determine the presence of sugar, quoting Charcot and Trousseau as if they were his roommates, issuing severe warnings in class against the mortal risks of vaccines while maintaining a suspicious faith in the recent invention of suppositories. He was in conflict with everything: his renovating spirit, his maniacal sense of civic duty, his slow humor in a land of immortal pranksters—everything, in fact, that constituted his most estimable virtues provoked the resentment of his older colleagues and the sly jokes of the younger ones.

His obsession was the dangerous lack of sanitation in the city. He appealed to the highest authorities to fill in the Spanish sewers that were an immense breeding ground for rats, and to build in their place a closed sewage system whose contents would not empty into the cove at the market, as had always been the case, but into some distant drainage area instead. The well-equipped colonial houses had latrines with septic tanks, but two-thirds of the population lived in shanties at the edge of the swamps and relieved themselves in the open air. The excrement dried in the sun, turned to dust,

1854: London

INFECTION POINT

The result of my inquiry into the eighty-nine deaths from cholera registered during the week ending September 2 was that the increase of disease was found only among the persons who were in the habit of drinking the water of the Broad Street pump well.

There are various ways in which the deceased persons may have taken it without the knowledge of their friends. The water was used for mixing with spirits in some of the public houses around. It was used, likewise, at dining rooms and coffee shops. The keeper of a coffee shop where the pump water was supplied at dinnertime informed me on September 6 that she was already aware of nine of her customers who were dead! The water of this pump was also sold in various little shops with a teaspoonful of effervescing powder in it under the name of sherbet, and it may have been distributed in various other ways with which I am unacquainted.

The death of Mrs. E——, who drank the water from Broad Street at West End, Hampstead, deserves especially to be noticed. A cart went from Broad Street to West End every day, and it was the custom to take out a large bottle of the water from the pump in Broad Street, as she preferred it. The water was taken out on Thursday, August 31. She was seized with cholera on Friday evening and died on Saturday.

On September 2 a carpenter, aged thirty, died. He was a foreigner and used to drink wine and water to his dinner. The water was procured by the people who kept the house, and they got it from Broad Street pump, as they thought the water better than that in Warwick Street, which is much nearer.

At 13 Wardour Street, near to Oxford Street, the wife of a tradesman died on September 2. Her husband informed me that they used to have pump water which the deceased used to drink. The boy was always directed to fetch it from Broad Street.

John Snow, from Report on the Cholera Outbreak. *Snow was an eighteen-year-old medical student when the first of the three major cholera epidemics to which he would bear witness struck England in October 1831. The third, which started in 1853, gave Snow the opportunity to test his theory—described by a colleague as “almost too revolting and disgusting to write and read”—that cholera was transmitted through a waterborne contagion rather than corrupted air.*

and was inhaled by everyone along with the joys of Christmas in the cool, gentle breezes of December. Dr. Juvenal Urbino attempted to force the city council to impose an obligatory training course so that the poor could learn how to build their own latrines. He fought in vain to stop them from tossing garbage into the mangrove thickets that over the centuries had become swamps of putrefaction, and to have them collect it instead at least twice a week and incinerate it in some uninhabited area.

He was aware of the mortal threat of the drinking water. The mere idea of building an aqueduct seemed fantastic, since those who might have supported it had underground cisterns at their disposal, where water rained down over the years was collected under a thick layer of scum. Among the most valued household articles of the time were carved wooden water collectors whose stone filters dripped day and night into large earthen water jars. To prevent anyone from drinking from the aluminum cup used to dip out the water, its edges were as jagged as the crown of a mock king. The water was crystalline and cool in the dark clay, and it tasted of the forest. But Dr. Juvenal Urbino was not taken in by these appearances of purity, for he knew that despite all precautions, the bottom of each earthen jar was a sanctuary for water worms. He had spent the slow hours of his childhood watching them with an almost mystical astonishment, convinced along with so many other people at the time that water worms were *animés*, supernatural creatures who, from the sediment in still water, courted young maidens and could inflict furious vengeance because of love. As a boy he had seen the havoc they had wreaked in the house of Lázara Conde, a schoolteacher who dared to rebuff the *animés*, and he had seen the watery trail of glass in the street and the mountain of stones they had thrown at her windows for three days and three nights. And so it was a long while before he learned that water worms were in reality the larvae of mosquitoes, but once he learned it he never forgot it, because from that moment on he realized that they and many other evil *animés* could pass through our simple stone filters intact.

For a long time the water in the cisterns had been honored as the cause of the scrotal hernia that so many men in the city endured not only without embarrassment but with a certain patriotic insolence. When Juvenal Urbino was in elementary school, he could not avoid a spasm of horror at the sight of men with ruptures sitting in their doorways on hot afternoons, fanning their enormous testicle as if it were a child sleeping between their legs. It was said that the hernia whistled like a lugubrious bird on stormy nights and twisted in unbearable pain when a buzzard feather was burned nearby, but no one complained about those discomforts, because a large, well-carried rupture was, more than anything else, a display of masculine honor. When Dr. Juvenal Urbino returned from Europe, he was already well aware of the scientific fallacy in these beliefs, but they were so rooted in local superstition that many people opposed the mineral enrichment of the

water in the cisterns for fear of destroying its ability to cause an honorable rupture.

Impure water was not all that alarmed Dr. Juvenal Urbino. He was just as concerned with the lack of hygiene at the public market, a vast extension of cleared land along Las Ánimas Bay where the sailing ships from the Antilles would dock. An illustrious traveler of the period described the market as one of the most varied in the world. It was rich, in fact, and profuse and noisy, but also, perhaps, the most alarming of markets. Set on its own garbage heap, at the mercy of capricious tides, it was the spot where the bay belched filth from the sewers back onto land. The offal from the adjoining slaughterhouse was also thrown away there—severed heads, rotting viscera, animal refuse that floated, in sunshine and starshine, in a swamp of blood. The buzzards fought for it with the rats and the dogs in a perpetual scramble among the deer and succulent capons from Sotavento hanging

One Lake, Northern Alberta, by Eamon Mac Mahon, 2004.



Something in the Water

Dubiously potent potables

1 Alcas River, Turkey

Claim: According to first-century Roman writer Pliny the Elder, liars who touch its waters will feel as if they are on fire.

2 Tap water, New York City

Claim: Imparts a superior and inimitable flavor and texture to pizza crusts and bagels.

3 Selemnus River, Achaea, Greece

Claim: Makes those who wash in it fall out of love. According to second-century Greek geographer Pausanias, its power is “of more value to mankind than great wealth.”

4 Pon Lai fountain, China

Claim: Gives the drinker a thousand lives.

5 Ganges River, India

Claim: When poured into a corpse’s mouth, helps break the cycle of reincarnation.

6 Zamzam Well, Mecca, Saudi Arabia

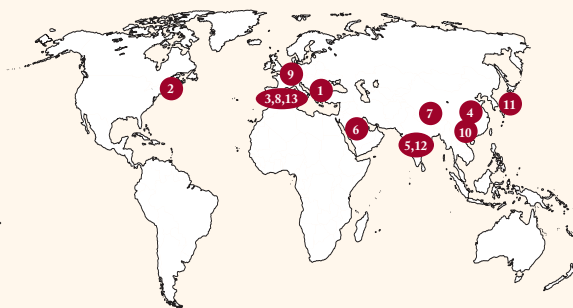
Claim: Thought to have miraculous healing powers, despite containing allegedly carcinogenic levels of arsenic.

7 Lake Manasarovar, Tibet

Claim: “Like pearls,” according to fifth-century Sanskrit poet Kalidasa, it “erases the sins of a hundred lifetimes.”

8 Castalian Spring, Delphi, Greece

Claim: Ritually purifies those who wash their hair in it; gives poetic inspiration to those who drink it.



9 Cachat Spring, Évian-les-Bains, France

Claim: Cured the kidney and liver complaints of the Marquis de Lessert in 1789.

10 Panyang River, Bama County, China

Claim: Extends the life span of those who drink or bathe in it; an unusually high number of centenarians live on the river’s shores.

11 Kagoshima hot springs, Kyushu, Japan

Claim: Perfectly clear when frozen due to a lack of minerals. A New York City whiskey bar has Kagoshima water flown in for its ice cubes.

12 Vajeriyan stepwell, Gujarat, India

Claim: Sharpens the blades of metal tools.

13 Spring water, Kea, Greece

Claim: “A draft from the spring is delightful,” writes Roman engineer Vitruvius around 25 BC, but “he who drinks will become dull as stone.”

from the eaves of the market stalls, and the spring vegetables from Arjona displayed on straw mats spread over the ground. Dr. Urbino wanted to make the place sanitary, he wanted a slaughterhouse built somewhere else and a covered market constructed with stained-glass turrets, like the one he had seen in the old *boquerías* in Barcelona, where the provisions looked so splendid and clean that it seemed a shame to eat them. But even the most complaisant of his notable friends pitied his illusory passion. That is how they were: they spent their lives proclaiming their proud origins, the historic merits of the

city, the value of its relics, its heroism, its beauty, but they were blind to the decay of the years. Dr. Juvenal Urbino, on the other hand, loved it enough to see it with the eyes of truth.

Gabriel García Márquez, from *Love in the Time of Cholera*. Born in Colombia in 1927, García Márquez worked for newspapers in Cartagena and Barranquilla from 1948 to 1952. *Love in the Time of Cholera*, inspired by two elderly Americans who met surreptitiously every year in Acapulco, was first published in 1985. The *cólera* of the original title carries a double meaning, which relates lovesickness to chronic illness; the Spanish word refers to both the disease and to choleric passion.

1988: Kaveri River

LIFEBLOOD

It was Upen who had the idea. Crowds were jostling at the bus station. There was no place at all to sit out the next six hours. She thought she wouldretch and die if she heard that Tamil film song, interrupted in the middle by a kind of cough, just once more. A knot tightened at the pit of her stomach.

"Taru, the river flows close by. Why don't we go there?"

Taru thought about it. She didn't know much about rivers. She had been ten years old when she was shown the water flowing at the bottom of a small square hole and told, "This is the source of the river Kaveri." At that very instant a leech had attached itself to her thigh. When they had burned it with a cigarette and pulled it away, blood had come spurting. She remembered the blood. Somewhere in the depths of her mind, the notions of river and blood became one. But in no other way was she moved by rivers.

She had seen rivers when traveling on trains, far below; sometimes as narrow as the cord tying back her hair; at other times spreading like a many-headed Ravana. The rivers she had seen were glimpsed through the iron bars of the windows of her railway carriage, or flashing intermittently upon her eyes as the train rattled past the iron supports of bridges.

Their forms had been incomplete.

They were magical blue lines, but also sometimes brown as the bed of sand beneath, or waterweed green, or gutter-black and covered in soap suds. It seemed impossible to link all these images into the notion of a river.

"What do you think?"

"Very well. Come on."

When they reached the riverbank, there were very few people there. A few men were swimming in the distance. Five or six women were washing clothes nearby. The river was dark gray, with touches of blue. They sat on its bank.

She looked at those women. They were laughing at something or the other. Laughing,

they beat their clothes against the stones, again and again. One of them was rubbing a piece of turmeric against a small stone. The glass bangles she wore moved up and down, rising and falling. She scraped off the ground turmeric and smeared it upon her cheeks, her feet, and into her armpits. She dived into the water with a little leap and lifted her head about a foot further away. Again she dived in, and reappearing still further away, lifted both hands high up and shook away the water from her hair sideways, starting from just above her ears. Very slowly. As if she had any amount of time to spare.

Taru watched the river flowing about the woman's waist.

The water you touch in a river is the last of that which has passed and the first of that which is coming.

—Leonardo da Vinci, c. 1517

"Taru, shall we go into the water?"

Upen stood ready to go in, having changed out of his clothes.

"You go in first."

He went a bit further, climbed in, walked along, parting the water with his hands, and then began to swim.

The river flowed on, drawing to itself all that was going on, in it and about it, like a sannyasi, without being troubled or fragmented. That steadfastness seemed to loosen all the constrictions within her.

Women of the epics must have stared at the river water, having set afloat upon it small bamboo baskets carrying their babies. They had trusted the river as they set down their baskets upon its water, giving them a firm, thrusting push with their hands. And as the baskets floated away upon it, the river, too, had changed its form. It was no longer just a river but the waters that support life. The waters of the womb. The water upon which the tiny fetus floats. The river was but an extension of the same waters, into the world outside.

She looked at the river.



Woman Standing at Water's Edge, attributed to Girolamo dai Libri, c. 1520.

It seemed to offer protection. One could dare to put one's trust in it.

She opened her bag and took out a *lungi*. She tied it to her chest and removed her clothes.

She placed her feet in the river. When she was waist-high in the swiftly running water, her feet began to tickle. Fish! They were biting her feet. She shrieked, then laid her head back and laughed out loud. Swiftly she dipped under and rose. She walked on, parting the water and splashing. The river spread out over her. She kicked her legs out again and again and began

to float. When she lay back and looked up, the sun's rays shone right into her eyes. Again she wanted to laugh.

Ambai, "River." Tamil writer and scholar C.S. Lakshmi wrote her first fiction under the nom de plume Ambai—adapted from a character in the Mahabharata who, later in the story, becomes a man named Shikhandi—when she was a teenager. She has called herself "a feminist who has lived without compromise." At the age of seventy-two in 2016, she again addressed her position. "Feminism has always been a bad word," she told an interviewer. But "one must continue to do what one believes in."

2017: Marshall Islands

ABOVE THE SALT

On coral atolls like the Marshall Islands, there are no spring-fed rivers, no mountain lakes, no bucolic streams. Fresh water comes from the sky. The Marshallese collect water in rain buckets on the roofs of their houses or in collection ponds at the airport. Mother Nature sometimes collects it in narrow underground aquifers—what geologists call freshwater lenses. As long as the rains continue, everything is okay. But if it stops raining for a few months, as it did in 2013 and again in 2015, then there is trouble. Marshallese find themselves in the very Robinson Crusoe-like predicament of dying of thirst while surrounded by water.

Fresh water has always been an issue on coral atolls. But as populations have grown, the problem has become more acute. It's one thing to collect enough rainwater on an island for three hundred people. It's something else entirely to do it for a city of thirty thousand.

The Marshallese have dealt with this in a sensible way—by increasing the amount of water they can collect. But there is not enough land to build enormous reservoirs; you also can't dig too deep before you hit salt water bubbling up from below. Instead, they have built a series of collection ponds near the airport to capture runoff from the tarmac—they look like a row of swimming pools covered with black plastic (to reduce evaporation). The water is polluted by grease and oil and bird droppings, so it has to be treated and filtered before it can be drunk. When the reservoirs are full, they hold 34 million gallons of fresh water, enough for the people of Majuro to survive for several months.

Only about one-quarter of the people on Majuro are connected to the municipal water supply from the airport, however. The other 22,000 or so residents—as well as another 20,000 people who live scattered around on outer atolls—rely on rainfall either collected in plastic drums or pumped out of the freshwater lens in the ground. By necessity, the Marshallese

are very good at conserving fresh water. In New York City, the average person uses 118 gallons per day. In Majuro, it's 14 gallons per day.

Nevertheless, running out of drinking water is a perpetual worry in the Marshalls. The northern atolls get less than fifty inches of rain a year. Atolls to the south get about double that. As the climate warms, rainfall patterns are likely to change. According to some models, the Marshall Islands on average will get more rain in the coming decades, not less—and they'll also get hotter temperatures and longer droughts.

*Water its living strength first shows,
When obstacles its course oppose.*

—Johann Wolfgang von Goethe, 1815

But whatever happens with rainfall patterns, drinking water is likely to remain a concern. The airport reservoirs are surrounded by dikes, but nevertheless, when a big storm comes in, the waves sometimes break over the walls. "If we get overtopping, where salt water gets into our catchment, we have to dump the fresh water out into the lagoon," Kino Kabua, the deputy chief secretary in Majuro, told me. "As climate change comes in and sea levels rise, it's going to increase that danger."

The larger threat comes from salt water infiltrating the many lenses of fresh water on islands and atolls. These lenses are extremely sensitive and constantly shifting. They are often depleted during the dry season, becoming so brackish that they are undrinkable. When rain finally comes, it replenishes the lens, filtering down through the sandy soil and into the porous coral rock that forms the base of the atoll. The thickness of the lens depends on the size of the island, the amount of rainfall, and the height of the ocean. As you go deeper, the water gets more saline. Eventually, it becomes pure seawater.

The problem is, as seas rise, salt water pushes up from below, leaving less and less room for fresh water (which, being more buoyant, rides on top of the salt water). In addition,

C. 1500 BC: Punjab

DIVINATION

Waters, you are the ones who bring us the life force. Help us to find nourishment so that we may look upon great joy.

Let us share in the most delicious sap that you have, as if you were loving mothers.

Let us go straight to the house of the one for whom you waters give us life and give us birth.

For our well-being, let the goddesses be an aid to us, the waters be for us to drink.

Let them cause well-being and health to flow over us.

Mistresses of all the things that are chosen, rulers over all peoples, the waters are the ones I beg for a cure.

Soma has told me that within the waters are all cures and Agni who is salutary to all.

Waters, yield your cure as an armor for my body, so that I may see the sun for a long time.

Waters, carry far away all of this that has gone bad in me, either what I have done in malicious deceit or whatever lie I have sworn to.

I have sought the waters today; we have joined with their sap. O Agni full of moisture, come and flood me with splendor.

From the Rigveda. The oldest of four canonical Hindu sacred texts, the Rigveda comprises 1,028 hymns in its ten books, and is believed to be one of the earliest works composed in any Indo-European language. During the Middle Ages, these verses were often written on sheets of palm bark. Agni, the god of fire, is said to have been born of waters; according to Wendy Doniger, the text's translator, Agni is "the form of fire that appears as the lightning born of the clouds."

as seas rise, flooding from storm surges is likely to become more common. When an atoll is undated, salt water can seep into the freshwater lens, contaminating it. It can take years before it is again suitable for drinking.

A parallel problem, and one that is equally serious, is soil salinization. Tony de Brum, the country's foreign minister, often talks about the fact that it's getting harder to grow breadfruit, a staple food in the Marshall Islands, because the trees will no longer tolerate salty soils. In the Marshalls, the soil contamination comes from

using salty water for irrigation, but also from the increasingly frequent flooding that occurs during high tides and storm events. All over Majuro you can see wilted and dying breadfruit trees. Other staple crops, such as bananas and papayas and mangoes, have also been affected.

Government-run farms are experimenting with salt-resistant hybrids of crops such as taro and cassava. But as the soil gets saltier, the Marshallese will become more and more dependent on food imports. Even now, the old island diet of fish and fruit is mostly gone. Today, rice, flour, and meat are staples for breakfast, lunch, and dinner. Almost all of it is imported—at high prices (the Marshall Islands produce no rice, no wheat, no cattle). And the Marshallese are bearing the costs in other ways, too: 65 percent are overweight or obese. More than 30 percent have diabetes, one of the highest rates in the world.

Increasingly salty soils and drinking water are not just a concern for island states. In Miami, salt water is gradually pushing deeper in the shallow aquifers beneath the city, threatening the region's drinking water supply. In Vietnam's Mekong delta, salt water-contaminated soil is rendering once productive land sterile, leaving millions of people without traditional crops like rice. In Egypt, freshwater supplies are decreasing at alarming rates, and the country may face nationwide shortages by 2025. According to one recent study, dwindling access to freshwater and the increasing salinity of the Nile delta's agricultural land threaten to make the country uninhabitable by 2100. In Bangladesh a study by the World Bank and Bangladesh's Institute of Water Modelling published in 2015 suggests that in a worst-case scenario, the area served by freshwater rivers in the country's coastal areas will drop by half in the coming decades. "The biggest problem we have is with water," Asma Begum, a villager in Gabura on the coast of Bangladesh, told a BBC reporter. "It is everywhere, but it is not drinkable. And it is destroying our land."

Salt is also destroying Bangladesh's rice crop, just as it is in Vietnam and other delta re-



If I Could Swim I Could Become a Merman, by Cecilia Borgenstam, 2014. Archival pigment print.

gions in South Asia and Southeast Asia. This has tremendous implications for food security, since rice accounts for 70 percent of the calories consumed by the country's 160 million people. Researchers are experimenting with more salt-tolerant varieties of rice, but progress has been slow. Instead, many Bangladeshis are turning to shrimp farming, since shrimp thrive in brackish waters. But shrimp farming, in many cases, just makes the problem of salinization worse. The shrimp industry has coerced farmers to transform more freshwater ponds into saline, which has allowed salt water to flow deeper and deeper into the delta, turning what was once a habitable region where families could grow vegetables and raise chickens into a practically marine environment.

In contrast to salty soils, salty drinking water has a relatively easy technological fix—if you have the money. Right now, the biggest desalini-

zation plant in the world is in San Diego. It cost \$1 billion to design and build. The plant takes in 100 million gallons of Pacific Ocean water a day and produces 54 million gallons of fresh, drinkable water. That's only about 10 percent of what San Diego County needs, but it is reliable and drought-proof. Like most other desalinization plants, this one uses a process called reverse osmosis, which forces seawater through a thin membrane, removing salt and other impurities. One reason it is so expensive is the tremendous amount of energy required to push the water through the membrane—the San Diego plant uses about 35 megawatts of power, which costs about \$30 million a year. The high price of desalinization is one reason why 70 percent of the plants in the world are in rich oil nations of the Middle East. Saudi Arabia alone is planning to spend \$28 billion constructing new plants in the coming years.

A Swimming Pool Library

Literary swimmers



Iris Murdoch

Venue of choice: Thames, near Oxford

In July 1996 the novelist, who had Alzheimer's, wrote her last journal entry. She and her husband, John Bayley, went for a swim, as they often had over the years, "in the usual secret place."



Hunter S. Thompson

Venue of choice: Atlantic Ocean

"From two hundred yards out in the surf, I could see people moving around in the dim yellow windows of the McGovern press room," the gonzo journalist—in Miami for the 1972 Democratic National Convention—wrote of an early morning swim. "But they couldn't see me, bobbing around in the rain-thrashed surf that I suddenly realized was carrying me out to sea."



Algernon Charles Swinburne

Venue of choice: Sea off the Isle of Wight

"A dream, and more than a dream, and dimmer At once and brighter than dreams that flee, The moment's joy of the seaward swimmer Abides, remembered as truth may be."



F. Scott Fitzgerald

Venue of choice: Swimming pool

"All good writing is swimming under water and holding your breath," Fitzgerald wrote to his daughter. In 1936 he broke his shoulder while diving to impress a nurse in Asheville, North Carolina: "In midair I felt something crack, and after I hit the water I had quite a struggle to get to the border of the pool and hang on to the rail until obliging friends could pull me up."



Lord Byron

Venue of choice: Hellespont

In 1810 the twenty-two-year-old poet swam across the stretch of water separating Europe and Asia—his attempt to prove that the mythical Leander could have traveled back and forth across the strait for trysts with Hero. Leander "swam for love," Byron later wrote, "as I for glory."



Edna St. Vincent Millay

Venue of choice: Swimming pool at Steepletop

Millay's home in Austerlitz, New York, had a spring-fed pool surrounded by tall trees to shield guests who enjoyed swimming nude.



Rupert Brooke

Venue of choice: Byron's Pool

In August 1911 the poet skinny-dipped with a twenty-nine-year-old Virginia Woolf in this Cambridge weir pool named after Lord Byron, who swam there as a student. "I stood naked at the edge of the black water in a perfect silence," he wrote of another plunge. "The water stunned me as it came upward with its cold, life-giving embrace. Was it the splendid shock that made me think the river was quivering?"



Edgar Allan Poe

Venue of choice: James River

Offended that his own six-mile swim in the strong currents of Virginia's James River had been compared to Byron's exploit, Poe wrote to a friend that "any swimmer 'in the falls' in my days would have swum the Hellespont and thought nothing of the matter."



Robert Lowell

Venue of choice: Atlantic Ocean off New England

"Do you remember," the poet wrote to Elizabeth Bishop in 1957, "how at the end of that long swimming and sunning Stonington day, we were talking about this and that about ourselves and you said, rather humorously yet it was truly meant, 'When you write my epitaph, you must say I was the loneliest person who ever lived.'"

Poor nations like the Marshall Islands use small, portable desalinization machines for emergency drought relief. But they produce only a few thousand gallons of water a day, require a lot of fuel, and break down often. Water experts who visit the islands are experimenting with simpler technology, including plastic tents that create freshwater by evaporation. Those work well enough, although the quantities of water they produce are small and they are vulnerable to being wiped out in storms. Desalinization technology will certainly get better, cheaper, and more rugged over time. But it still introduces a tech-

nological dependency that increases the cost, the complexity, and the risk of living on a remote atoll. Some may manage it just fine. But for others, it is likely to be one more reason to leave.

Jeff Goodell, from *The Water Will Come*. Born in 1960 in Sunnyvale, California, Goodell briefly worked as a technical writer at Apple Inc. at age twenty-one. "It did not thrill me," he later wrote of that time, and he soon quit to deal blackjack in Lake Tahoe. Goodell has been a contributing editor at Rolling Stone since 1996. Of his six books, three focus on anthropogenic climate change, which he described in a 2017 interview as a "dawn of a kind of new age of living with water."

1942: Henan

THE SKIES WERE CLOSED

Dawn came slowly, like the gradual illumination of a stage in the darkness. Peasants, sprawled about the station for acres, were waiting for the next train to take them away to the west and food. Most of them had come on trains that sneaked by the Japanese guns in the dark. Flatcars, boxcars, old coaches, were stuffed with people; tight huddles braced themselves on the roofs. It was freezing cold, and the trains hurtled through the danger zone, the fingers of those who were clinging to the car roofs became numb; the weak fell under the steel wheels of the trains, and as we retraced our route later that day, we saw their torn and bleeding bodies lying by the roadbed. But most of the peasants were coming under their own power, by foot, by cart, by wheelbarrow. This station was the great exit to the province, a narrow spout between the Japanese to the north and the mountains to the south, and here the refugees clustered till they could move on to relief facilities in the west.

A great stink suffused the mob. Dry sweat, urine, common human filth, scented the morning. The peasants shivered in pulsing reaction to the cold, and their gray and blue rags fluttered and quivered in the wind. Here and there the smeared red remnant of a bridal costume on a wrinkled woman broke the monotony of color; sometimes a squalling baby drew attention to its filthy scarlet wrapping. Steaming breath rose in vaporous clouds; noses trickled water; eyes were dark wounds in frigid faces. Feet were swathed in dirty rags, and heads covered with discolored, filthy towels.

There were corpses on the road. A girl no more than seventeen, slim and pretty, lay on the damp earth, her lips blue with death; her eyes were open, and the rain fell on them. People chipped at bark, pounded it by the roadside for food; vendors sold leaves at a dollar a bundle. A dog digging at a mound was exposing a human body. Ghostlike men were skimming the stag-

nant pools to eat the green slime of the waters. We whipped our horses to the quickest possible pace in the effort to make Zhengzhou by evening of the third day. As dusk closed, snow began to fall, light and powdery. Once our horses stumbled in a field and sheered off violently from two people lying side by side in the night, sobbing aloud in their desolation. By the time we entered the city, the snow was heavy enough to muffle the thudding of our horses' hooves.

Henan is a fertile province. Before the war, it supported some thirty million people, who farmed the rich loess soil exhaustively and pressed upon it to the Malthusian limit. The cash crop was spring wheat, which the peasants sowed in late autumn and harvested in mid-May; their secondary crops were millet and corn, which were sown immediately after

Water is H₂O, hydrogen two parts, oxygen one, but there is also a third thing, that makes it water and nobody knows what that is.

—D.H. Lawrence, 1929

the wheat harvest and gathered in by fall. In 1940 and 1941 the crops had been poor, and the normal carryover disappeared; in 1942 the spring wheat failed for lack of rain. The government took its usual share of the spring wheat in taxes; in that season of shortage it meant almost the whole crop. Blithely the provincial authorities assured themselves that rain would certainly fall and give the peasants enough millet and corn to fill their hungry bellies. But no rain fell. All through the summer of 1942, the skies were closed and the grain withered on the stalk; by autumn the province was destitute.

The West, with a vast system of modern communications and the economy of the world to draw on, has forgotten for decades what famine means. But in the Orient, where hundreds of millions still rely on whatever can be grown within a day's walk of their birthplace for their sustenance, famine is still one of the recurring threats of life. There are only two ways to deal with famine, both of them simple, but both



Fish at Play, attributed to Zhao Kexiong, twelfth or thirteenth century.

requiring major decision and swift execution. One is to move grain into the stricken areas in bulk and as swiftly as possible; the other is to move people out of the stricken areas in bulk and as swiftly as possible. No great wisdom is required to foresee a famine; if there is no rain, there will be no crop, and if no crop grows, people will die.

Journeying through the land by horseback for two weeks, we talked each day with peasants and small officials. The snow that fell during our journey soaked the fields, and the spring wheat of the next season stood tall and green. It mocked the peasants with promise of

food two months in the future. "It is fine, yes," said an old man, "but who knows whether we will be alive to eat it?"

Theodore H. White and Annalee Jacoby, from *Thunder Out of China*. After graduating from Harvard in 1938, White spent six years reporting from East Asia as a foreign correspondent for *Time*. In 1944 Jacoby, a reporter and screenwriter, joined him in Chongqing, where the two began their collaboration on *Thunder*. Their coverage of the Henan famine brought news of the drought to the world's attention. Liu Zhenyun, a descendant of famine victims, has credited the coverage in *Time* with initiating the response from a previously neglectful Chinese government.

1675: Delft

SMALL WORLD

About halfway through September, I discovered living creatures in rain, which had stood but a few days in a new tub that was painted blue within. This observation provoked me to investigate this water more narrowly; and especially because these little animals were, to my eye, more than ten thousand times smaller than the animalcule that Jan Swammerdam has portrayed, and called by the name of water flea, or water louse, which you can see alive and moving in water with the bare eye.

Of the first sort that I discovered in the said water, I saw, after divers observations, that the bodies consisted of five, six, seven, or eight very clear globules, but without being able to discern any membrane or skin that held these globules together, or in which they were enclosed. When these animalcules bestirred themselves, they sometimes stuck out two little horns, which were continually moved, after the fashion of a horse's ears. The part between these little horns was flat, their body else being roundish, save only that it ran somewhat to a point at the hind end, at which pointed end it had a tail near four times as long as the whole body, and looking as thick, when viewed through my microscope, as a spider's web. At the end of this tail, there was a pellet of the bigness of one of the globules of the body; and this tail I could not perceive to be used by them for their movements in very clear water. These little animals were the most wretched creatures that I have ever seen; for when, with the pellet, they did but hit on any particles or little filaments (of which there are many in water, especially if it has but stood some days), they stuck entangled in them, and then pulled their body out into an oval and did struggle by strongly stretching themselves to get their tail loose, whereby their whole body then sprang back toward the pellet of the tail, and their tails then coiled up serpent-wise, after the fashion of a copper or iron wire that, having been wound close about a round stick, and then taken off, kept all its windings. This

motion, of stretching out and pulling together the tail, continued. I have seen several hundred animalcules caught fast by one another in a few filaments, lying within the compass of a coarse grain of sand.

I also discovered a second sort of animalcules, whose figure was an oval; and I imagined that their head was placed at the pointed end. These were a little bit bigger than the animalcules first mentioned. Their belly is flat, provided with divers incredibly thin little feet, or little legs, which were moved very nimbly, and which I was able to discover only after sundry great efforts, and wherewith they brought off incredibly quick motions. The upper part of their body was round and furnished inside with eight, ten, or twelve globules; otherwise these animalcules were very clear. These little animals would change their body into a perfect round, but mostly when they came to lie high and dry. Their body was also very yielding, for if they so much as brushed against a tiny filament, their body bent in, which bend also presently sprang out again, just as if you stuck your finger into a bladder full of water and then, on removing the finger, the inpitting went away. Yet the greatest marvel was when I brought any of the animalcules on a dry place, for I then saw them change themselves at last into a round, and then the upper part of the body rose up pyramid-like, with a point jutting out in the middle; and after having thus lain moving with their feet for a little while, they burst asunder, and the globules and a watery humor flowed away on all sides without my being able to discern even the least sign of any skin wherein these globules and the liquid had, to all appearance, been enclosed.

Antonie van Leeuwenhoek, *from a letter to the Royal Society. Born during the Dutch golden age, Leeuwenhoek was sixteen when he first encountered a simple microscope—a mounted glass lens—while working for a cloth merchant in Delft. After reading Robert Hooke's Micrographia while on a trip to London, he expanded his explorations in microscopy and in 1674 began recording his observations of "animalcules" in letters to Henry Oldenburg, secretary of the Royal Society. This 1676 letter is now considered to have birthed protozoology and bacteriology.*

1979: Rwanda

WEATHER FORECAST

The rain fell on the lycée of Our Lady of the Nile. How many days and weeks had it been? Everyone had stopped counting. Mountains and clouds were but a single grumbling chaos, as if on the first or last day of the world. The rain streamed down the face of Our Lady of the Nile, washing off her black mask. The supposed source of the Nile flooded over the edge of the basin in a raging torrent. Passersby on the path—in Rwanda there are always passersby on the path, though you never know where they're coming from or where they're going—took shelter beneath giant banana leaves that the thin film of water changed into green mirrors.

For many long months, rain becomes the sovereign of Rwanda, a far greater ruler than the former king or the current president. Her coming is eagerly awaited and entreated. Famine or plenty, it's Rain who will decide. Rain, the good omen of a fertile marriage. First rains, at the end of the dry season, making children dance as they turn their faces skyward to re-

ceive the fat drops for which they've longed. Shameless rain, revealing the budding curves of all young women beneath their drenched wraparounds. Violent, capricious, punctilious Mistress, pitter-pattering on every sheet-metal roof, on those sheltering in the banana groves or in the muddy neighborhoods of the capital. She who casts her net over the lake, and diminishes the volcanoes' hugeness; she who reigns over the vast forests of the Congo, the very guts of Africa. Rain, endless Rain, unto the ocean that bore her.

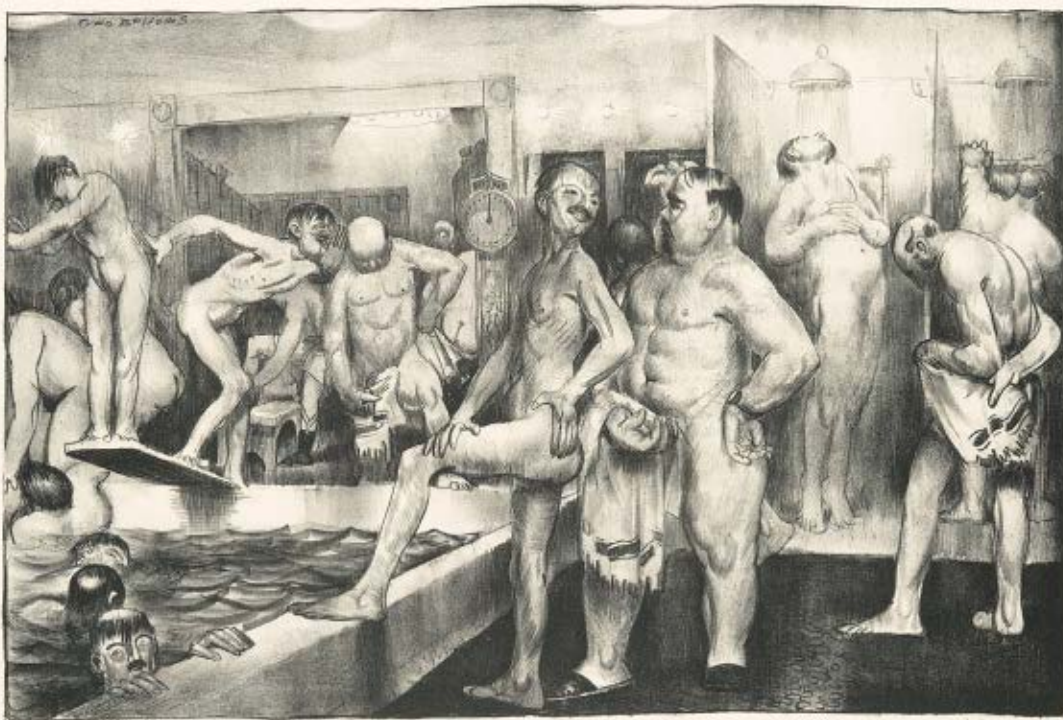
"Maybe it rains like this the world over," said Modesta, "maybe it will just keep on raining and never stop, maybe it's Noah's flood all over again."

"Just imagine, girls," said Gloriosa, "if it was the flood, we'd soon be the only ones left on earth, the lycée's way too high up to drown, it'd be like the ark. We'd be alone on earth."

"And when the water ebbs away—because it's bound to one day—it'd be up to us to repopulate the earth. But how will we manage if there are no boys left?" Frida said.

"C'mon," said Virginia. "The flood's an *abapadri* tale. Where I come from, up on my

Shower-Bath, First State, by George Bellows, 1917.



hill, we abandon the fields as soon as it rains and gather around the fire. Vacation time. No need to fetch water, because we make banana-leaf gutters to catch the rain. We can shower and do our washing at home. We spend our time roasting corn as we roast our feet.”

“And we have the *abavubyi* in Rwanda, the rainmakers,” said Veronica. “They’re the ones who control the rain, making her start or stop. But perhaps they’ve forgotten how to make her stop. Or else they’re taking revenge on the missionaries who make fun of them and denounce them to the district authorities.”

“And do you believe in those *abavubyi*?”

“I’m not sure, but I know one, an old woman. I went to see her with Immaculée, she lives nearby.”

“Tell us.”

“One Sunday after Mass, Immaculée told me, ‘I want to go see Kagabo, the healer. You know, the one who sells strange medicines at the market. I’m a little scared to go see him alone. Want to come along?’ Of course I was ready to accompany Immaculée. I was curious to see what she was up to with that witch doctor the sisters call the devil’s henchman.

“We walked up to Kagabo, trembling a little. Immaculée was too afraid to address him. He eventually spotted us and beckoned. ‘What can I do for you, my belles demoiselles?’ Quickly, Immaculée whispered, ‘I need your help, Kagabo. You see, the thing is, I’ve got a suitor, in the capital. I’m scared he’ll chase after other girls, that he’ll dump me. Give me something to keep my sweetheart, so he has eyes only for me, so he doesn’t see any other girls, so there’s only one girl for him in all the world. I don’t want to see another girl on his motorbike.’ Kagabo answered, ‘I deal with sickness, I’m a healer, love problems don’t concern me. But I know someone who can help you out, and that’s Nyamirongi, the rain-maker. She doesn’t just deal with clouds. Give me a hundred francs, and I’ll take you to see her next Sunday. You can bring your friend along, but she’ll have to pay a hundred francs, too. Come when the market packs up and we’ll go to Nyamirongi’s.’

“So the following Sunday, me and Immaculée went to the far side of the market. Kagabo had already tucked away his witch’s wares in an old bag woven from fig-tree bark. ‘Hey, you two, follow me, and hurry it up. Do you have my money, and more for Nyamirongi?’ We handed him our hundred-franc bills and off we went, along the track that led down to the village. Kagabo pointed out a little hut to us, behind a rocky mound, like those of the Batwa people. A white smoke drifted out of it, spreading and mixing with the clouds. ‘Wait,’ said Kagabo. ‘I’ll see if she’ll let you in.’ We waited a long time. We could hear whispers, moans, and high-pitched laughter from inside the hut. Kagabo emerged. ‘Come,’ he said. ‘She’s finally put her pipe down. She’ll happily see you.’

Rain is grace; rain is the sky condescending to the earth; without rain there would be no life.

—John Updike, 1989

“We ducked to enter the hut. It was very dark and filled with smoke. Eventually, we spotted glowing red coals and, behind them, a shape wrapped in a blanket. A voice from under the covers spoke: ‘Come closer, come closer.’ Kagabo motioned for us to sit down. Then the covers parted slightly, and we saw an old woman’s face, wrinkled, crumpled like a shriveled passion fruit but with eyes that burned as bright as embers.

“She turned to Immaculée: ‘So, Kagabo tells me it’s you who wants to see me.’

“Immaculée explained to her that she had a sweetheart in the capital but that she’d heard, or rather some friends had written to tell her, that they’d seen him with other girls on his motorbike. She wanted Nyamirongi to put a stop to that, to make her sweetheart quit going out with them, so he would be hers, and hers alone.

“Nyamirongi rummaged in the various calabashes and pots piled up all around her. She took out some seeds, which she examined for a while, then selected a few and placed them in a mortar. She crushed the seeds to a powder and spat on them, all the while mumbling some inaudible

C. 1535: Europe

MINERAL WATER

In the beginning it pleased God to make one element—water—into which he infused the power of generating minerals, so that they might immediately grow, and thus adapt themselves to human needs. Water, I say, he destined for this function, that it should be the matrix of the metals, by means of fire, salt, and mercury. He separated it from the other three elements into a peculiar body which was not in the air, in the earth, in the sky, but was something special, different from these. This he placed on the lower globe so that it might be above the earth and occupy the cavity in the earth where it lies.

Now, in this element are the generations of all metals and stones, which exhibit themselves under multifarious natures and forms. Moreover, as you see, all fruits grow out of the earth into the air, and none of them remain in the earth, but go out of it and separate themselves from it, so growing out of the water, there go forth metals, salts, gems, stones, talcs, marcasites, sulfurs, etc.—all proceeding from the matrix of this element into another matrix, that is, into the earth, where the water completes its operation, but the root of minerals is in the water, as the root of trees and herbs is in the earth. But they are brought to perfection above the earth, and pass on to their ultimate matter, which is entirely in the air.

Paracelsus, from Book of Minerals. *"A man who, in certain moments, gives evidence of a remarkable penetration, and in others raves in the most pitiable way possible" is how historian of science Ferdinand Hofer described Paracelsus. Born in 1493 in Switzerland as Philippus Aureolus Theophrastus Bombastus von Hohenheim, the physicist and alchemist conducted research that established the role of chemistry in medicine. He was the first to determine that minerals in drinking water—particularly lead—could cause goiters.*

words, and made a thick concoction that she wrapped in a banana leaf, like cassava paste.

"Here, take this. You're going to write to your sweetheart—you're a lycée girl, you can write, even women know how to write these days! The paste will be dry in three days, you'll grind it to a powder and slip some into an envelope, but don't forget, before you do that, rub some over your

breasts, and the rest. When your suitor opens the letter, he'll breathe in the powder, and I promise, you'll keep your sweetheart all to yourself, he'll stop going off with other girls. Now give me five hundred francs, and he'll have eyes for you alone, he'll think only of you, you'll hold him captive. I give you the word of Nyamirongi, daughter of Kitatire, but you must let him caress you all over, and I mean all over, understand?"

"She picked up her pipe and drew three puffs on it. Immaculée handed her a five-hundred-franc note, which she tucked beneath her blanket. Then she turned to face me: 'And why did you come? What do you want from me?'"

"They said you control the rain. I want to see how you do it."

"You're too curious. I don't control the rain; I talk to her, and she answers. I always know where she is, and if I ask her to come or go, and if she feels like it, she does what I ask. You young girls at the *abapadri* school, you no longer know anything. Back when I was young, before the Belgians and the chief of the *abapadri* ousted King Yuhi Musinga, they respected me, even then. They knew of my power because it came from my mother, who received it from her own mother, who had received it from her mother, who herself received it from our ancestor Nyiramvura, "She of the Rain." I lived in a large enclosure at the foot of the mountain, a large enclosure near a watering hole. When the rains were late, and you know what the rain is like, she never knows when she's due, the chiefs led their cattle to my watering hole, which never ran dry. They brought their young dancers, the *intore*. And they'd say, "Nyamirongi, tell us where the rain is, tell her to come, and we'll give you cows, jugs of mead, and cloth so you can dress as if you were at court with the king." And I replied, "First, you must dance for the rain, after your cattle have slaked their thirst. Your *intore* must dance for the rain." And the *intore* danced before me, and when they had danced enough, I told the chiefs, "Return to your enclosures, for the rain is coming, she'll catch up with you before you get there." And the rain fell on the cattle, on the beans, on the corn, on the taro; it



Krishna and Balarama by a River, miniature from an 1840 edition of the Bhagavata Purana.

fell on the sons of Gihanga: on the Tutsi, on the Hutu, on the Batwa. I saved the country often, which is why they called me Umubyeyi, Mother, mother of the country. But when the *bazungu* gave the drum to the new king, they chased me from my enclosure, they wanted to hang me, and I hid in the forest for a long time. Now that I am old, I live alone in this Batwa hut. People go to the *abapadri* to make them bring the rain. But do these whites know how to talk to the rain? The rain hasn't been to school; she won't listen to them: the rain does as she pleases. You need to know how to talk to her. So some people still seek me out, like your friend here. And not just about the rain. If you want to know how I talk to the rain, and how the rain, if she is so inclined, obeys me, then dance for the rain, dance here before me for the rain. It's been so long since anyone danced before me for the rain.'

"Nyamirongi! You can see very well I can't dance in this lycée uniform, and your hut is much too small, but please, tell me anyway where the rain is now.'

"Well, if you don't wish to dance, give me five hundred francs, and I'll tell you where the rain is.'

"I gave her the five hundred francs.

"Right, you're a good girl. I'll show you what I'm capable of.'

"She stretched out her right arm and made a fist, but with her forefinger pointing toward

the hut's rounded roof. A long nail stuck out like an eagle's talon. She moved her arm so that the forefinger with its long nail covered the four points of the compass. Then she drew her arm back beneath the blanket.

"I know where the rain is. She is over the lake, and she tells me she's coming. Leave now, quickly, run fast before she catches you. I see her, she's coming, she's crossing the lake. Give me another five hundred francs if you don't want to be struck by lightning. You made the rain angry because you didn't dance for her. Give me five hundred francs, and the lightning will spare you.'

"Hurry,' said Kagabo. 'Do as she says and let's go.'

"We ran and ran down the mountain and down the track. Clouds were massing, rising toward us. Thunder rumbled. Just as we entered the lycée gates, a torrential rain began to fall, and lightning ripped across the sky."

Scholastique Mukasonga, from *Our Lady of the Nile*. Born in 1956 to a Tutsi family in Rwanda, Mukasonga was trained as a social worker, and moved to France in early 1992. She lost more than thirty members of her family in the 1994 genocide in Rwanda, including her mother. In 2006, at fifty years old, Mukasonga published her first book, a memoir. Six years later appeared *Our Lady of the Nile*, her first novel, set in the years leading up to the genocide at a girls' school, where Veronica, who narrates this anecdote, is one of two Tutsi students.

1996: Hamden, CT

HOMELAND SECURITY

Foreigners who learn Vietnamese soon find out that the word for “water” and the word for “a homeland, a country, a nation” are spelled the same way in the romanized script and are pronounced the same way: *nuoc*. This is an instance where, by synecdoche, a part—the most essential part—has come to represent the whole: water, as the most precious resource of the homeland for growing crops (in particular, rice) has come to stand for the homeland itself. Those who have not discerned that dual acceptance of the one word *nuoc* have missed the origin of Vietnamese culture and what merges all its disparate elements into a coherent system.

*The thirsty earth soaks up the rain,
And drinks, and gapes for drink again.*

—Abraham Cowley, 1656

On the strength of archaeological research in the twentieth century, scholars now think that wet-rice farming originated in Southeast Asia, from which it spread as of the middle of the second millennium before the Christian era and reached southern China under the Han. Both myth and history show the omnipresence and prominence of rice, proving that it has always played a crucial role, as either the staple food or a symbol, in Vietnamese culture.

Rice exists in countless varieties, but the kind that yields crops large enough to sustain an expanding population grows best on flooded land; what comes in importance before all else is water. No less fervently than their forebears who learned to wrest a livelihood from the soil in the plains of the Hong and Ma Rivers, present-day Vietnamese peasants regard water as the most essential of all factors for successful rice farming. This saying, allegedly coined by an agronomist, Nguyen Cong Tieu, in the 1930s, has acquired wide currency and even proverbial status because, graced with the lilt of a true folk

proverb, it spells out all the required elements in the right order of importance: “First, water; second, manure; third, labor; fourth, seed.” Vietnamese peasants likewise say, “Without water and manure, it’s no use working hard.” Throughout the year, in one way or another, rice farmers have to cope with water, making sure that there be neither too little nor too much of it; irrigation, drainage, and flood control make up the bulk of their activities.

From the start, for good and for ill, water has governed the thoughts and lives of the Vietnamese ever since their ancestors migrated from the mountains to grow rice in the plains below. The earliest descriptions of their agriculture before Han rule suggest how the ancient Vietnamese brought the swamps and marshes of northern Vietnam under cultivation. Most likely, they built drainage ditches and canals with water gates and irrigated their paddy fields by using the rise and fall of the tides in the rivers.

Of those remote times, millennia ago, the language still bears many traces and carries many echoes. Every day, all Vietnamese use basic words with a “water” connection few speakers suspect, unless they stop and think about each one of them. *Nuoc*, however, remains the word with the most pervasive denotations and connotations in the Vietnamese vocabulary. It encompasses multifarious meanings, and it is resonant with subtle undertones capable of arousing the strongest emotions. In different contexts it has to be translated by scores of different English words. It means still water, water that ebbs and flows or the tide, water that runs or rivers and streams. Water, needed for growing rice to eat, is also needed for drinking. *Nuoc* is the drinking water from a well or any beverage. It is the juice from fruits, too. Water is so appreciated as the basic thirst quencher by the poor and the rich alike that daily meals are simply referred to as “rice and water” (*com nuoc*). Indigents who own few utensils and lack such things as bowls and cups “eat rice from a small pot and drink water from a flask” (*com nieu nuoc lo*). The well-to-do can afford “white rice and clear water” (*com trang nuoc trong*). *Nuoc* is any liquid or some body fluid.



Homesteaders' Tree, Cherry County, Nebraska, by Andrew Moore, 2011.

It is the outward gloss, the “water” of a diamond, the complexion of a skin. It is the pace of a runner, the gait of a horse. It is the move on the chessboard or a way to play your cards. Broadly, it is a step you take in order to reach some goal. It is a pass you come to, and also a way out of the difficult spot. And more.

But the most significant derivation from the meaning of *nuoc* as “water” is the concept of people who have gathered near a body of water to grow rice for one another, founding a stable community, sharing rain and drought, plenty and famine, peace and war; from “water,” its basic meaning, *nuoc* has come to designate “the homeland, the country, the nation.” It is in this ultimate acceptance that the monosyllable *nuoc* reverberates through the deepest and farthest recesses of the Vietnamese collective unconscious and stirs there the most potent feelings.

The nation’s fateful course, marked by ups and downs, is figuratively rendered as a “tide of water” with its ebb and flow. The highest virtue demanded of a Vietnamese is that he or she “love the *nuoc*.” The worst opprobrium that can attach to any individual is that he or she has “sold out the *nuoc*.” To say in English that a man has “lost his country” is not the same as to say in Vietnamese that he has “lost the *nuoc*”; if the English phrase sounds almost abstract, the Vietnamese expression evokes an ordeal by thirst, the despair of a fish out of water. People who are selfish and materialistic under normal circumstances will risk their lives when called upon by some charismatic leader to “save the *nuoc*.” In the Vietnamese language, “to build the country” is, literally, “to raise the waters” (*dung nuoc*).

In the earliest times, long before Chinese conquest and influence, the Vietnamese people

must have equated the *lang*, or rural congregation, with their one and only community, with their country or homeland. It was unlikely that they ever entertained the notion of a state, a commonwealth far larger than their *lang* and including people they never met face-to-face, to which they would give both a proper noun and their allegiance.

Like their colleagues in the West, Vietnamese scholars often discuss “nationalism” (*chu-ngħia quoc-gia*) in the abstract, positing the concept of a *quoc-gia* or “nation.” But no Vietnamese peasant can possibly say *quoc-gia* without feeling awkward or unnatural, like trying to speak in a tongue they do not understand.

As rice farmers, under leaders attuned to rural society or springing from the peasantry

itself, the Vietnamese have defended not their *quoc-gia* but their *lang nuoc*, their “waters”; at the village level, Vietnamese “nationalism” has meant the survival instinct of peasants threatened in their very existence, a reflex instilled in the collective unconscious ever since their ancestors left the mountains for the plains below, in quest of water to grow rice.

Huynh Sanh Thong, from *“Live by Water, Die for Water.”* Born near Saigon in 1926, Huynh immigrated to the United States in 1948 after having spent a year in a French colonial prison for his involvement with the Vietnamese independence movement. He published his translation of *The Tale of Kieu*—an epic poem considered to be Vietnam’s premodern masterpiece—in 1973. Huynh launched *The Vietnam Review* in 1996. *“Live by Water, Die for Water”* appeared in its first issue.

Our Relationship, by Chianxiang Shang, 2015.



C.1843: Lafourche Parish, LA

SAFE PASSAGE

Looking up the bayou, I saw Tibcats and two others on horseback, coming at a fast gait, followed by a troop of dogs. There were as many as eight or ten. Distant as I was, I knew them. They belonged on the adjoining plantation. The dogs used on Bayou Boeuf for hunting slaves are a kind of bloodhound, but a far more savage breed than is found in the northern states. They will attack a Negro at their master's bidding and cling to him as the common bulldog will cling to a four-footed animal. Frequently, their loud bay is heard in the swamps, and then there is speculation as to what point the runaway will be overhauled—the same as a New York hunter stops to listen to the hounds coursing along the hillsides, and suggests to his companion that the fox will be taken at such a place. I never knew a slave escaping with his life from Bayou Boeuf. One reason is, they are not allowed to learn the art of swimming, and are incapable of crossing the most inconsiderable stream. In their flight they can go in no direction but a little way without coming to a bayou, when the inevitable alternative is presented, of being drowned or overtaken by the dogs. In youth I had practiced in the clear streams that flow through my native district, until I had become an expert swimmer, and felt at home in the watery element.

I stood upon the fence until the dogs had reached the cotton press. In an instant more, their long, savage yells announced they were on my track. Leaping down from my position, I ran toward the swamp. Fear gave me strength, and I exerted it to the utmost. Every few moments I could hear the yelpings of the dogs. They were gaining upon me. Every howl was nearer and nearer. Each moment I expected they would spring upon my back—expected to feel their long teeth sinking into my flesh. There were so many of them, I knew they would tear me to pieces, that they would worry me, at once, to death. I gasped for breath—gasped forth a half-uttered, choking prayer to the Almighty to save

me—to give me strength to reach some wide, deep bayou where I could throw them off the track, or sink into its waters. Presently, I reached a thick palmetto bottom. As I fled through them, they made a loud rustling noise, not loud enough, however, to drown the voices of the dogs.

Continuing my course due south, as nearly as I can judge, I came at length to water just over shoe. The hounds at that moment could not have been five rods behind me. I could hear them crashing and plunging through the palmettos, their loud, eager yells making the whole swamp clamorous with the sound. Hope revived a little as I reached the water. If it were only deeper, they might lose the scent and, thus disconcerted, afford me the opportunity of evading them. Luckily, it grew deeper the farther I proceeded—now over my ankles—now halfway to my knees—now sinking a moment to my waist, and then emerging presently into more shallow places. The dogs had not gained upon me since I struck the water. Evidently they were confused. Now their savage intonations grew more and more distant, assuring me that I was leaving them. Finally I stopped to listen, but the long howl came booming on the air again, telling me I was not yet safe. From bog to bog, where I had stepped, they could still keep upon the track, though impeded by the water. At length, to my great joy, I came to a wide bayou and, plunging in, had soon stemmed its sluggish current to the other side. There, certainly, the dogs would be confounded—the current carrying down the stream all traces of that slight, mysterious scent, which enables the quick-smelling hound to follow in the track of the fugitive.

Solomon Northup. *from Twelve Years a Slave.* Born to a freedman in upstate New York, Northup was a landowner and musician awaiting the birth of his third child when two men kidnapped him and sold him into slavery in 1841. Though the success of this account, published after his 1853 rescue, established him as a popular abolitionist speaker, he disappeared from public records within a decade. In 2013 it became the first memoir written by an enslaved American to be adapted into a feature film.

c. 820: Chang'an

JUST ADD WATER

I

In old age
I'm back
to childhood pleasures.

A bowl in the ground
Just add water—
it's a pool!

Throughout the night
frogs croaked
till it dawned,

as they did
when I fished
as a child at Feng-k'ou.

II

Who says
you can't make a pond
out of a bowl?

The lotus sprig
I planted not long ago
has already grown full-size.

Don't forget,
if it rains
stop in for a visit.

Together we'll
listen to raindrops splash
on all the green leaves.

III

Come morning,
the water brightens
as if by magic.

One moment alive
with thousands of bugs
too small to have names,

Next moment
they're gone,
leaving no trace,

Only the small fish
this way and that
swim in formations.

IV

Does the bowl
in the garden
mock nature

when night after night
green frogs gather
to prove it's a pool?

If you choose to come
and keep me company
need you fill

the dark with noise
and endless squabble
like husband and wife?

V

Say the bright pond
mirrors the sky
both blue.

If I pour
water, the pond
brims.

Let night
deepen
the moon go

how many stars
shine back
from the water!

Han Yu, "The Pond in a Bowl, Five Poems." According to historian Jie Liu, the term *penchi*, or "basin pools," first appeared in this poem, although it's likely that such pools were already being cultivated in imperial, private, and temple gardens at the time of its writing. The site for each pool would have been carefully selected to best attract birds, frogs, and dragonflies. A poet, essayist, and progenitor of neo-Confucianism, Han was officially named a "Master of Letters" on his death.

1954: Cambridge, MA

WHERE THE WEST BEGINS

The West begins out where the average rainfall drops below twenty inches. As always with the West, there is variability here, and contrast, unpredictability, and illusion. There is a zone of varying width and shape, and it is not square with the compass. Its boundary shifts east and west as much as three hundred miles—meaning the line west of which twenty inches of rain falls in a year. Nor is “twenty inches” an absolute; it is an expedient generalization. We are dealing with the amount of rainfall that enables agriculture to be conducted without irrigation, and there are modifying factors—season of greatest precipitation, altitude, wind, rate of evaporation—and these necessitate the concept of “equivalent rainfall.” Equivalent rainfall makes the eastern boundary of the West not a straight north–south line but an irregular curve. In the southeastern corner of Texas, the West begins not far inland from the Gulf of Mexico. In Kansas the line of twenty inches is four-fifths of the way to the Colorado line, but the West begins long before you get there. The ninety-eighth meridian of west longitude corresponds fairly well to the line of twenty inches. The hundredth meridian corresponds somewhat less closely, but well enough, to the line established by the modifying factors and equivalent rainfall. Geographical convention has established the hundredth meridian as the beginning of the West; it is an expedient convention and will be adhered to here.

The hundredth meridian divides the Dakotas in tolerably equal halves. It crosses the Missouri River halfway between the Grand Detour and Pierre. Rather more than half of Nebraska, including the town of North Platte, is west of it. Only a third of Kansas is west of it; it misses Dodge City by a little more than a hoot and less than a holler. It is the boundary of the Texas panhandle and may serve here as the boundary of West Texas.

However, climate may shift the boundary three degrees east or west and in extremity

even farther. Human folly and one of the most abiding of the West’s illusions have repeatedly moved it much farther west. Divide North Dakota into three zones of equal width. Normally, if that word has meaning in this context, the central zone, which the hundredth meridian bisects, would be the marginal one. Normally, agriculture would be stable in the eastern zone because there is sufficient rainfall there, and stable in the western zone because irrigation is always necessary there. This central zone, in fact, was the one that John Wesley Powell, the great prophet of the West, said must forever exist on the knife edge—since in some years there would be enough water for crops and in other years there wouldn’t be.

Nothing is more useful than water; but it will purchase scarce anything; scarce anything can be had in exchange for it.

—Adam Smith, 1776

But in reality the uncertain zone is much wider than that central third, wider in human folly, illusion, and tragedy, and wider in the variability of rainfall. And let me say at once that, though we may speak with acceptable accuracy of a wet and dry cycle, it is not symmetrical; it is an uneven and unpredictable oscillation.

Last year the dry half of the cycle pushed the line of insufficient rain all the way across the Dakotas to the Red River and, south of that river, well into Minnesota. This year the pattern was different and the Dakotas were normal, as that word applies here, and some portions of New Mexico and Arizona that had been drought-bound for five successive years were approaching normality again, but in Kansas the line of insufficient rainfall pushed east of Topeka, almost within sight of Kansas City. Similarly, in the wet half of the cycle, years of abundant rain have swung the line westward to the Montana and Colorado lines. At such times, hope and illusion have pushed it much farther west.

The West, then, is the United States west of the hundredth meridian. It is a country without

2015: Flint, MI

PUBLIC DISSERVICE

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

City of Flint Did Not Meet Treatment Requirements

Our water system was recently found to be in violation of a drinking water standard. Although this incident was not an emergency, as our customers, you have a right to know what happened and what we are doing to correct this situation.

WHAT SHOULD I DO?

There is nothing you need to do unless you have a severely compromised immune system, have an infant, or are elderly. In that case, you may be at increased risk and should seek advice about drinking water from your health care provider. You do not need to boil your water or take other corrective actions. If a situation arises where the water is no longer safe to drink, you will be notified within twenty-four hours.

WHAT DOES THIS MEAN?

This is not an emergency. If it had been an emergency, you would have been notified within twenty-four hours. People who drink water containing trihalomethanes in excess of the maximum contaminant level over many years may experience problems with their liver, kidneys, or central nervous system, and may have an increased risk of getting cancer.

WHAT IS BEING DONE?

We are currently working on solutions to correct the problem. We anticipate resolving the problem in 2015.

From a water advisory issued to Flint citizens. When Flint changed its water source from the Detroit River and Lake Huron to the Flint River in 2014, proper treatments were not put in place; city residents soon experienced widespread lead contamination. Whistleblowers and local advocates called attention to the public health crisis despite government denials. Five days after the city downplayed the problem in this advisory, the state of Michigan announced that employees at the Flint State Office Building would be provided with special water coolers.

rain enough to grow crops. A country with a deficit rainfall. A country that has crops and towns because it also has mountains, and because snow falls on the mountains in the winter

and melts in the spring and summer, and flows down the rivers as water that can be taken to fields and town reservoirs.

Snow courses have been laid out in all mountain ranges. They are measured expanses, reasonably level and reasonably open, sited so that they will not lie in snow shadows or be unduly windswept. At stated intervals throughout the winter, representatives of various federal and state bureaus, universities, and private businesses visit them to measure the snowpack. To measure its depth and the rate at which it is accumulating or diminishing, and to take core-boring just as geologists do when prospecting for oil or probing for bedrock. When these observations have been correlated with various others, the Bureau of Reclamation will predict—with reliable accuracy—how much water its dams must release to irrigation systems next summer, at what rates, and even in what weeks. Power companies will predict whether and when they will have to call on standby steam-generating plants to firm up their power. Crop yields, crop loans, car loading, sugar and wine production, meat prices, hotel receipts, gasoline taxes, bank deposits—to some degree all these and many other matters can be forecast. Almost, the graph of the snowpack could tell a rural social worker how much bastardy she will report next year, or a priest how many marriages he will perform.

The altitude at which the useful snow deposits occur varies. In the mountains of northern Idaho it may be less than two thousand feet, in Arizona above eight thousand feet. Mainly it is high and I have already stated the generalized line of critical snow: it is seven thousand feet. In the West life, society, agriculture, business, and industry depend on the snow that falls at and above seven thousand feet.

A light winter means a hard summer. If the line withdraws to eight thousand feet, or as it sometimes does in the Sierra to ten thousand, we are in for trouble. The pressure of the snow drought on marginal agricultural lands, those on the fringes of irrigation systems that cannot be assured their full allotment, becomes

ominously severe. Crops dwindle. Stock growers can move their herds only to certain summer ranges and keep them there only for a short season, and must sell in a falling market. Municipalities know that they will have to restrict the sprinkling of lawns. The anxiety that underlies and encloses the Western consciousness tightens toward dread.

It is an immemorial and unchanged dread. Purified by continence and emetics and prayer, the priests scatter the sacred cornmeal to make roads for their chants and the supernaturals to travel. Yucca roots form soapy clouds in bowls of spring water. Snakes slither in zigzag paths, the gods are told that clouds and rivers and the breasts of women are sinuous, and the drums make the sound of the thunderbird's obsidian wings. A forest ranger thrusts a hollow rod into the snow. That thy people may have corn. The earth is the Pimas' sleeping nude who will conceive if a raindrop falls in her navel. Not when: *if*.

Perhaps it remains true that mankind and society cannot exist in the West. The answer, we must remember, is not yet in. Therefore, understand another element in that consciousness which I have had to mention several times already, the anxiety that is as deep as the pride. In fact, deeper.

It rests on orderly strata of simplicities. You must get to the water hole or you will die, but the water hole may be dry when you get there. Your crops must get water or you will be bankrupted, but the rains may come at the wrong time or may not come at all. Snowslide, blizzard, norther, hailstorm, flash flood—no one can say when they will come, no one can secure himself against their coming, everyone knows they will come. The crickets march out of the hills, the budworm settles in the stand of Douglas fir, halogeton appears in the sheep range. The earth stirs in its sleep and the flume that brings water to a town breaks, or the main canal is ruptured and bent back on itself. A hot wind blows throughout July. Brine starts flowing in your well.

There was just so much dust in the gravel at Bonanza Bar, and just so much more in

the hillsides above it. When the bar had been panned and the hillsides sluiced down—finish. In hard rock the vein pinched out or the shaft got down to a point beyond which the pumps could not keep even with the water—the end. So a thousand ghost towns. And fifty times as many traces of color, from two hundred feet below sea level in Death Valley to fourteen thousand feet above in Uncompahgres—they were just color, not ore. Or the irrigation system for which we mortgaged our fields and bonded our

Any party which takes credit for the rain must not be surprised if its opponents blame it for the drought.

—Dwight Morrow, 1930

future brought a fine yield for a few years, and then the fields were waterlogged or alkalied—and that was that. Or we built the system and there was simply not enough yield from the fields it fructified. The water that failed and the crop that failed are each a typical Western story. No less typical is the boom that failed because the stuff ran out—metal, timber, gas, oil, cropland, rangeland. Always across that bright sky falls the shadow that never withdraws or lessens; there may be an end to our venture, too.

This is the accepted risk of disaster from natural circumstance. Part of the drama of the West, it has worked into the Western metabolism. Western society has—more or less—come to terms with the hostile environment, has produced something like an equilibrium, is able to hold it off but only just. And only in a way. And perhaps only for a time.

Bernard DeVoto, from *The Western Paradox*. A defender of American public lands and a historian who won a Pulitzer Prize for his book *Across the Wide Missouri*, about the beaver fur trade, DeVoto was born in Utah in 1897, lived for many years in Massachusetts, and wrote often about the American West. From 1935 to his death in 1955, he wrote the *Easy Chair* column in *Harper's Magazine*. "Nobody took a neutral position on Benny DeVoto," wrote his friend Wallace Stegner, "any more than he took a neutral position on anything or anyone."



EBB & FLOW

2015: Mexico City

JONATHAN WATT'S WATCHES WHERE THE WATER RETURNS

When a *tormenta* sweeps in to Mexico City, the rain does not just fall, it insists. Gently at first with a midafternoon patter on windows and windshields, then more urgently with an evening downpour that turns splashes into puddles, until finally—with a nighttime climax of thunder and lightning rolling down from the distant volcanoes—the deluge gushes through gutters and gullies, transforming trickles in runnels into torrents in tunnels. The floods are a reminder of the natural order of things: water belongs here.

This geological, historical fact is a reason why the Aztecs built a city of floating gardens here seven hundred years ago that became known as the “Venice of the New World.” The vast lakes that once filled the plain were, however, steadily drained by settlers. In the sixteenth century, Spanish conquistadores rapidly accelerated the process, and modern engineers have almost finished the task, replacing the lacustrine marshes with a gray sea of concrete, tarmac, and steel that, in the central city alone, is now home to almost nine million residents.

As a result, supplies for drinking, washing, cooking, and cleaning must be pumped up from hundreds of feet underground, or from a distance of more than sixty miles. Getting the required millions of gallons up to this megalopolis—7,900 feet above sea level—is one of the world’s great feats of hydroengineering. If mastery over water is a marker of civilization, then Mexico City is surely one of mankind’s most spectacular achievements.

Yet from the point of view of sustainability and social equality, it is also among the more absurd failures. Discharging a resource that falls freely from the heavens and replacing it with exactly the same H₂O from far away is expensive, inefficient, energy intensive, and ultimately inadequate for the population’s needs. It also creates a paradox: although Mexico City has more rainy days than London, it suffers shortages more in keeping with a desert, making the price of each gallon among the highest in the world—despite its often dire quality.

The growing costs—social, economic, health, and environmental—are a source of stress and conflict. Government leaders and big businesses are pushing ahead with ever bigger hydroengineering projects that upset conservationists and indigenous groups. Congress and NGOs are fighting over the possible privatization of water. Meanwhile, shortages and floods are creating social tensions in the Federal District and its surrounding states.

Supply cuts are frequent and charges are high, particularly the electricity bill for lifting each gallon of water out from the Cutzamala reservoir system, the biggest single source of water for Mexico City. “Cutzamala water is probably the most expensive on the planet,” says Manuel Reyes, head of supply at the Mexico City Water Department, better known as Sacmex. “This is definitely the biggest hydroengineering challenge in Latin America, maybe the world.”

First, water passes through a tunnel under the western Sierra de las Cruces; then it goes to holding tanks near the Cárcamo de Dolores—home to the once-underwater mural *Water, the Source of Life* by the artist Diego Rivera; then on to a second chlorination plant to remove

toxins (each year, the city uses 22,600 tons of chlorine at a cost of \$3.3 million); and then aqueducts and pipes—approximately 1,200 miles in the primary network of trunk pipes, and a further 7,500 miles of smaller pipes within each district.

The engineers tell me Mexico City has the greatest demand for water of any city in the world—80 gallons for each of the 8.8 million inhabitants, plus millions of others who work here during the day. Quenching that thirst is a demanding job, not least because close to 40 percent of the water in the system is lost through leaks.

“There are huge problems,” says Ramón Aguirre, head of Sacmex. “The city is overpopulated, the underground water quality is poor, and in some areas we are having to pump water up hills of one thousand feet in altitude inside the city. This is a huge challenge.”

About 70 percent of the city has fewer than twelve hours of running water per day. In the hardest-hit areas, 18 percent of the population has to wait several days for just an hour or two of supply. The situation gets worse in periods of drought.

Washing Horses in a River, detail of a Chinese silk handscroll, 1309.



Pipe pressure matches income levels—both of which go down the farther you get from Cutzamala. In the wealthy western boroughs of Miguel Hidalgo and Cuajimalpa, where most of the city's golf courses are situated, water pressure is two hundred pounds per square inch, enough for lawn sprinklers. Closer to the center, in the commercial districts of Polanco and Benito Juárez, the upper and middle classes have to get by with less than half that pressure and face occasional shortages. This is nothing, though, compared to the situation in eastern Iztapalapa, where pipe pressure is just seven psi and taps are dry more often than not.

Sacmex invests more in this borough than any other, but the scale of the challenge is overwhelming. City officials explain that Iztapalapa's development was largely unplanned. About 1.8 million (mostly poor) people have moved to the area over the past four decades, and the infrastructure is slowly being built around them. It does not help that the well water in the area contains a toxic cocktail of chemicals—magnesium, nitrogen, sodium, iron, and sulfuric gas—that has to be filtered in purification plants. Even so, on those rare days when something comes out of the tap, it can be red or yellow or smell like rotten eggs.

Despite the efforts of the best engineers at the National Water Commission (better known as Conagua), water has never completely stopped flowing naturally to where it historically belongs. Instead of resisting this, a growing number of conservationists and hydroengineers believe it could be the solution to Mexico City's problems.

The focus of their attention is the Valle de Chalco, the deepest part of the Mexico City watershed, which sits just outside the eastern boundary of the Federal District. Little more than a hundred years ago, this was home to the last of the great lakes on the plain. Residents used to commute from here to the city by steamboat, until the waters were drained to create farmland and roads in the late nineteenth century.

But in the past few decades, the Lago de Chalco has started to return. Soon after the 1985 earthquake, the authorities drilled thir-

1893: Sicily

HIGH AND DRY

By the end of April there was great distress in Sicily for lack of water. The drought had lasted six months. Every day the sun rose and set in a sky of cloudless blue. The gardens of the Conca d'Oro, which surround Palermo with a magnificent belt of verdure, were withering. Food was becoming scarce. The people were in great alarm. All the most approved methods of procuring rain had been tried without effect. Men, women, and children, telling their beads, had lain whole nights before the holy images. Consecrated candles had burned day and night in the churches. Palm branches, blessed on Palm Sunday, had been hung on the trees. At Salaparuta, in accordance with a very old custom, the dust swept from the churches on Palm Sunday had been spread on the fields. In ordinary years these holy sweepings preserve the crops; but that year, if you will believe me, they had no effect whatever. At Nicosia the inhabitants, bareheaded and barefoot, carried the crucifixes through all the wards of the town and scourged each other with iron whips. It was all in vain. Even the great Saint Francis of Paola himself, who annually performs the miracle of rain and is carried every spring through the market gardens, either could not or would not help. Masses, vespers, concerts, illuminations, fireworks—nothing could move him. At last the peasants began to lose patience. Most of the saints were banished. At Palermo they dumped Saint Joseph in a garden to see the state of things for himself, and they swore to leave him there in the sun till rain fell. Other saints were turned, like naughty children, with their faces to the wall. Others again, stripped of their beautiful robes, were exiled far from their parishes, threatened, grossly insulted, ducked in horse ponds. At Licata the patron saint, Saint Angelo, was left without any garments at all; he was reviled, he was put in irons, he was threatened with drowning or hanging. "Rain or the rope!" roared the angry people at him, as they shook their fists in his face.

James Frazer, from *The Golden Bough*. While studying classics at Glasgow University, Frazer agreed to write the "Taboo" and "Totemism" entries for the ninth edition of the *Encyclopedia Britannica*. His *Golden Bough*, which posits that the human mind evolved from magical understanding to an enlightened secularism, was first published in 1890. Between 1911 and 1915, he released an expanded version, in which this anecdote appears.

teen wells nearby that emptied aquifers, caused subsidence, and then—as the surface fell—created a giant puddle that just kept growing. After almost a century, the water had found its way back.

This is still not officially recognized on maps, but the lake now stretches over 1,400 acres. Migrating cranes and storks rest on the wetlands here. Old men fish; young children play in the water. There are even sailboats. It is hard to believe that a short distance away from this body of water, on the other side of the Sierra Santa Catarina, more than a million people are suffering shortages in Iztapalapa.

“This should be the heart of the solution,” said Elena Burns, an activist with the Water for People, Water for Life campaign, as she looks out across the reeds and marshes. “Lakes are a really cheap way of dealing with this problem. If we made this lake twenty-six feet deep, we’d have enough water for 1.5 million people.”

Burns, a naturalized Mexican citizen, is co-founder of the Watershed Commission of the southeastern Mexico Valley water basin, which is exploring the possibility of using natural catchment areas to solve the city’s water problems. It includes scientists, environmentalists, and the two main government organizations dealing with water issues, Conagua and Sacmex.

The Watershed Commission’s management plan estimates that many problems in this area—groundwater overexploitation, subsidence, sewage flooding, lack of access, and poor quality—could be solved by deepening the lake and building a waste treatment plant nearby. This would cost 7 billion pesos (\$380 million), less than a third of the money the government has already spent on wastewater tunnels.

The president of the commission, Oscar Monroy, who is one of Mexico’s leading authorities on wastewater management, says this should be part of a citywide scheme to collect rainwater rather than have it pumped from ever-more distant sources.

Monroy estimates that harvesting an area of eight square miles would be enough to provide for the city’s needs. As well as lakes and

cleaned-up rivers, this could mean storing the rainwater collected by the roofs of shopping malls, schools, and condominiums. “It’s not alien technology,” he says. “It can be done with existing technology. But it will only work if the government wants to, and right now they don’t.”

Burns believes the authorities are too wedded to megaprojects to accept low-cost, sustainable solutions like turning Lake Chalco into a reservoir. “Ramón thinks this is a tiny project. He’s a wells-and-dams kind of guy. He likes spending money on expensive projects like long tunnels and deep wells that don’t get us anywhere near sustainability.”

She sounds idealistic—but there is logic to her argument that appeals not just to conservationists and academics. Marco Alfredo, president of the Mexican Association of Hydroengineers, also advocates a return to the city’s lacustrine origins.

“Mexico City’s situation is chaotic and absurd. We could have natural pure water, but for hundreds of years we have been draining it away so we have created an artificial scarcity,” he says. “This is not an engineering problem. We have the expertise and the experience. It is also not a problem of economics. We have the financial resources to do what needs to be done. It’s a problem of governance.”

For Alfredo, the key is to work with, rather than against, the element that first attracted settlers to this high-altitude lake land. “Water is not just remarkable, it’s miraculous,” he says. “It has a memory, an intelligence, it’s extremely strong. And it will always return. No matter whether it takes five, fifty, or five hundred years. It will come back.”

From “Mexico City’s Water Crisis.” A little more than a year after this report ran in the Guardian, an article in the New York Times about Mexico City’s water crisis quoted Arnoldo Kramer, the city’s resilience officer. “Climate change has become the biggest long-term threat to this city’s future,” said Kramer. “We can’t begin to address any of the city’s real problems without facing the climate issue.” Watts is the Guardian’s global environment editor and the author of When a Billion Chinese Jump.



Newport Rocks, by John Frederick Kensett, 1872.

C. 2040 BC: Ur

BIG DIG

Who will dig it? Who will dig it?
The canal of sacred joy, who will dig it?
The canal whose channel is cleansed, who will dig it?
Ur-Namma, the wealthy one, will dig it!
The vigorous youth, the prosperous one, will dig it!
As for me, Ur-Nammu, my city's watercourse is fish, its flow is birds.
Ur's fresh water is fish, its flow is birds.
Enki, god of water, planted the sweet plant in my canal, now the carp grow fat.
In Ur he planted the sweet plant, now the carp grow fat.
As for me, my city's *zi* reeds are sweet, so my fish may eat them.
Ur's *zi* reeds are sweet, so my fish may eat them.
As for me, since my canal was founded, it is full of fish and birds.
Since it was founded in Ur, it is full of fish and birds.
Its king, the king of Eridu—your foliage is joy!
Nudimmud, the king of Eridu—your foliage is joy!
As for me, may he bring sweet waters in my canal!
May he weigh me things out for basket loads.
In Ur may he bring sweet waters in my canal!

"Ur-Namma the Canal Digger." This hymn to King Ur-Namma, who established the third dynasty of Ur by uniting city-states of southern Mesopotamia into a new polity, survived in forms of varying lengths from the neo-Sumerian period. Aside from advancing infrastructure projects—along with digging canals, the king had roads built and temples restored—Ur-Namma was also the progenitor of a law code, the earliest known from Mesopotamia.

1869: Washington, DC

THEORY AND PRACTICE

The troublesome factor in the great problem of the development of the agricultural capacity of the vast western plains is the supply of water. Furnish this, and the fertile prairies and valleys east of the Mississippi will soon find a strong rival contending with them in the grain marts of the world for precedence. Furnish this, and the “Great American Desert” of old geographers will soon become one mighty field of flowing grain. Furnish this, and the few other minor impeding factors will soon be eliminated. The streams rushing down from the mountains slacken their course on the level plains where the great battle between moisture and aridity begins. Is there any power in the human grasp to assist nature in this struggle and turn the scale in her favor?

Before attempting to give a direct answer to this question, I will state some facts connected with this matter, and then advance a theory, which, if correct, is of great importance in developing the agricultural capacity of this country.

When we reached the Cache à la Poudre, at Laporte, Colorado, I heard it remarked that this stream now, and for a few years past, has been sending down a larger volume of water than it formerly did. I thought little of the matter at the time and let it pass, simply noting the statement. But when I reached the next stream in our journey south, the same thing was repeated in regard to other streams in that section. And to confirm the statement, certain streams were pointed out, which, up to about 1862, had been in the habit of drying up annually at certain points, which since that time at these points have been constantly running. This caused me afterward, during the whole length of our journey along the eastern flanks of the mountains, to make this a special subject of inquiry.

And somewhat to my surprise, I have found the same thing repeated at almost every point as far south as Las Vegas, in New Mexico, and no opposing testimony. Streams bearing down heavier volumes of water than formerly;

others becoming constant runners which were formerly in the habit of drying up; springs bursting out at points where formerly there were none; acequias allowed to go to decay because they have not been needed, etc. Seven or eight years ago, it was not uncommon for the Pecos to dry up, but now such a thing would be looked upon as a strange event. And in building Denver, a mistake was made in relying upon the dry bottom of Cherry Creek, which shortly afterward sent down a rush of water to warn them of her slumbering powers. Nor does this wholly exhaust the testimony on this point, for in addition thereto is the uniform assertion of those who have resided in the Territory for ten or twelve years or more that for six or seven years past there has been a gradual increase of rain. It is a common expression of the Mexicans and Indians that the Americans bring rain with them.

All this, it seems to me, must lead to the conclusion that since the Territory has begun to be settled, towns and cities built up, farms cultivated, mines opened, and roads made and traveled, there has been a gradual increase of moisture. Be the cause what it may, unless it is assumed that there is a cycle of years through which there is an increase, and that there will be a corresponding decrease, the fact must be admitted upon this accumulated testimony. I therefore give it as my firm conviction that this increase is of a permanent nature, and not periodical, and that it has commenced within eight years past, and that it is in some way connected with the settlement of the country; and that, as the population increases, the amount of moisture will increase.

Cyrus Thomas, from Preliminary Field Report of the U.S. Geological Survey of Colorado and New Mexico. *Thomas' contribution to the report, commissioned by the U.S. Interior Department and edited by expedition leader Ferdinand Hayden, challenged the prevailing nineteenth-century idea about the Great American Desert. A botanist, Thomas believed that rain follows the plow—that tillage and settlement could alter an arid climate. But a ten-year drought that began in 1886 showed this to be incorrect. “By 1888,” wrote Wallace Stegner, Thomas “presumably regretted the opinion he had hazarded twenty years earlier.”*

2005: Beit HaEmek

SIGN OF SPRING

What should I say about Umm Hassan?

Should I mention the tears, or the memories, or say nothing?

Seated in the back seat of the little blue Volkswagen, she was looking out the window and seeing nothing.

"We're here," said Fawzi.

Her brother got out of the car and held out his hand to help her out. Umm Hassan moved her stout body forward but couldn't raise her head. She seemed unable to do so, as though her breasts were pulling her down toward the ground. She was bent over and rooted to the spot.

"Come on, Sister."

Fawzi helped her out of the car. She remained doubled over, then put her hand to her waist and stood upright.

He pointed to the house, but she couldn't see a thing.

Her tears flowed silently. She wiped them away with her sleeve and listened to her brother's explanations while his son played around with the camera.

"They demolished every single house, and built the Beit HaEmek settlement—except for the new houses, the ones that were built on the hill."

Umm Hassan's house had been one of the new ones up on the hill.

"All the other houses were demolished," said the brother.

"And mine?" murmured Umm Hassan.

"There it is," he said.

They were about twenty meters from the house. The branches of the eucalyptus tree were swaying. But Umm Hassan could see nothing. He took her by the arm and they walked. Then suddenly she saw it all.

The Fountain of Love (detail), by Jean-Honoré Fragonard, c. 1785.



"It's as if no time has passed."

She said that suddenly everything came back to her. She went up to the front door but didn't press the buzzer. She stood back a little and walked around the house. She sat on the ground with her back against the eucalyptus tree as she used to do. She'd been afraid of the tree, so she'd turn her back on it. Her husband would make fun of her for turning her back on the horizon and looking only at the stones and the walls. Her brother took her by the hand and helped her up. Again, it was difficult for her to stand, as though she were rooted to the ground. Her brother dragged her to the door and pressed the buzzer. No one opened, so he pressed it a second time. The ringing reverber-

ated louder and louder in Umm Hassan's ears; everything seemed to be pounding, her body was trembling, her pulse racing. The brother stood waiting.

The door finally opened.

A woman appeared: about fifty years old, dark complexion, large eyes, black hair streaked with gray.

Fawzi said something in Hebrew.

"Why are you speaking to me in Hebrew? Speak to me in Arabic," said the woman with a strong Lebanese accent.

"Excuse me, madam. Is your husband here?" asked Fawzi.

"No, he's not here. Is everything all right? Please come in."

Fullmoon@Baltic, by Darren Almond, 2015. Chromogenic print, 71 x 71 inches.



She opened the door wider.

"You know Arabic," Umm Hassan whispered as she entered. "You're an Arab, Sister—aren't you?"

"No, I'm not an Arab," said the woman.

"You've studied Arabic?" asked Umm Hassan.

"No, I studied Hebrew, but I haven't forgotten my Arabic. Come in, come in."

They entered the house. Umm Hassan said—like everyone else who's gone back to see their former homes—"Everything was in its place. Everything was just how it used to be, even the earthenware water jug."

The Israeli woman left her in front of the water jug and returned with a pot of Turkish coffee. She poured three cups and sat calmly watching these strangers whose hands trembled as they held their coffee. Before Umm Hassan could open her mouth to ask a thing, the Israeli woman said, "It's your house, isn't it?"

"How did you know?" asked Umm Hassan.

"I've been waiting for you for a long time. Welcome."

Umm Hassan took a sip from her cup. The aroma of the coffee overwhelmed her, and she burst into sobs.

The Israeli woman lit a cigarette and blew the smoke into the air, gazing into space.

Fawzi went out into the garden where Rami was playing with the video camera, filming everything.

The two women remained alone in the living room, one weeping, the other smoking in silence.

The Israeli turned and wanted to say something but didn't. Umm Hassan wiped away her tears and went over to the water jug, which stood on a side table in the living room.

"The jug," said Umm Hassan.

"I found it here, and I don't use it. Take it if you want."

"Thank you, no."

Umm Hassan went over to the jug, picked it up, and tucked it under her arm; then she went back to the Israeli woman and handed it to her.

1558: London

CHOOSE WISELY

Water is one of the four elements, lighter than earth, heavier than fire and air. But this water which is here among us in rivers, ponds, springs, floods, and seas be no pure waters, for they be mingled with sundry airs, corruptions, grossness, and saltiness, notwithstanding in all our meats and drinks, water is used, and among all living creatures cannot be forborne, among man, beast, fish, fowl, herb, and grass. And as Avicenna said, clay water is pure, for clay cleans the water and is better than water that runs over gravel, or stones, so that it be pure clay, void of corruption. Also, waters running toward the east be pure, coming out of hard stone rocks, and a pint of that water is lighter than a pint of the standing water of wells or pools. The lighter the water, the better it is. Also, water that is put in wine, etc., ought first to be sodden [boiled] so the fire does cleanse it from corruption. Standing waters, and water running near unto cities and towns, or marsh ground, woods, and fens be ever full of corruption because there is so much filth in them of carrions and rotten dung, etc. Ice and snow waters be very gross and be hurtful to the bodies of men and beasts. To drink cold water is evil, for it will stop the body and engender melancholy. Salt water helps a man from scabs, itch, and moist humors, it kills lice, and wastes blood between the skin and the flesh, but it is most hurtful to the stomach, but the vapor and smoke of it is good for them that have the dropsy.

William Bullein, from *The Government of Health*. Born on the Isle of Ely around 1515 to a family that may have been related to Anne Boleyn, Bullein began practicing as a physician in 1554 after resigning a rectorship due to his fervent Protestantism. He dedicated this medical text to his patron, Baron Thomas Hilton, in a note attacking those who slander physicians as poisoners. Shortly after the book's publication, Hilton died. Bullein married the baron's widow; he was promptly accused of poisoning his former benefactor.

"Thank you," said the Palestinian, "I don't want it. I'm giving it to you. Take it."

"Thank you," said the Israeli, who took the jug and returned it to its place.

The silence was broken—the two women burst out laughing. Umm Hassan started looking around the house. She stood in front of the bedroom but didn't go in. Next she went to the kitchen. In the sink were piles of dirty dishes. Umm Hassan turned on the tap and watched the water flow out, and the Israeli woman ran in saying, "I'm so sorry, it's a mess." Umm Hassan turned off the tap and said, laughing, "I didn't leave the dirty dishes. That was you."

The river

And the wave are the same.

When it rises up, it's water;

When it subsides, it's water.

Otherwise it cannot be.

—Kabir, c. 1500

The two women went out into the garden.

The Israeli woman gave Umm Hassan her arm and told her about the place. She told her about the orange grove where Iraqi Jews worked, the new irrigation projects the government had started, their fear of the Katyusha rockets, and about how difficult life was. Umm Hassan listened and looked and said one word: "Paradise. Paradise. Palestine's a paradise." When the Israeli woman asked her what she was saying, she answered, "Nothing. I was just saying that we call it an *orchard*, not a *grove*. This is an orange orchard. How wonderful, how wonderful."

"Yes, an orchard," said the Israeli.

Then Umm Hassan began telling the Israeli woman about the place.

"Where's the spring?" asked Umm Hassan. "What spring?"

Umm Hassan told her the story of her spring and how she'd discovered water in the field next to the house. When her husband had built the house, close to the eucalyptus tree, there had been no water. It was Umm Hassan who had discovered it. And one day she saw water welling up from the ground. She told the men, "We must dig here," and they dug, and water came gushing out. So they built a little

stone wall around the spring, and it became known as Umm Hassan's spring.

"Where's the spring?" she asked.

The Israeli woman couldn't answer. "There was a spring here," she said, "but they dug an artesian well around it and laid some pipes. Could that be it?"

"No, it's a natural spring," said Umm Hassan, and told how they'd decided to plant apple trees after they discovered the water. But the war.

Umm Hassan guided the woman to where her spring had been.

She didn't find it. Where it had been, she found a well walled with pipes and iron with a small tap on each side. Umm Hassan bent over to open the tap, and when the water gushed out, splashed her face and neck, sprinkled the water on her hair and clothes, and drank.

"Drink," she said. "Water sweeter than honey."

The Israeli woman bent over and washed her hands, and then turned off the tap without drinking.

"This is the most delicious water in the world."

The Israeli woman turned on the tap again, drank a little, and smiled.

Later Umm Hassan would say the Israelis don't drink water, just fizzy drinks. "They only drink out of bottles, even though Palestine's water is the best in the world."

In vain we tried to explain to her that they drink mineral water, not fizzy drinks, and that the people of Beirut have started to drink water out of plastic bottles, too, but she stuck to her guns and said, "They don't drink water. I saw them with my own eyes. You want me to question what I saw with my own eyes?"

Elias Khoury, from *Gate of the Sun*. Born into an Orthodox Christian family in Beirut, Khoury became a member of the Palestine National Liberation Movement after the Six-Day War between Israel and its neighboring states; he fought in the Lebanese Civil War against the Maronite Christian Phalange and its Israeli sponsors. "If you are a Beirut, you are an Arab," he said to a British reporter in 2005. "You are open to all types of cultures, and to innovating in the Arabic culture at the same time."

Swim at Your Own Risk

Legends of the deep



Ninki-nanka

Habitat

West African mangrove swamps.

Appearance

Dragon-shaped and up to fifty feet long, with mirrored scales.

Behavior

Eats children who wander too far from home. People who see it fall ill; most die within a few weeks. Part of Gambian folklore for generations, though sightings surged in the early 1990s.



Bunyip

Habitat

Australian creeks, billabongs, and rivers.

Appearance

Resembles a large dog or kangaroo (perhaps an aboriginal cultural memory of a giant marsupial that went extinct 25,000 years ago).

Behavior

Kills by hugging people to death or eating them; usually resorts to violence only when its home is threatened. Screams at night.



Wangxiang

Habitat

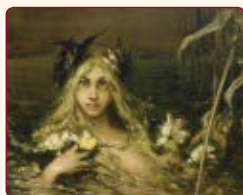
Chinese rivers and swamps.

Appearance

The size of a toddler, with red eyes, black skin, and red claws at the ends of its long arms.

Behavior

Spreads disease—especially malaria—but is not particularly violent; one fourth-century Chinese author reports that it is edible.



Rusalka

Habitat

Fresh water in Slavic lands, particularly in late spring and early summer.

Appearance

The spirit of a drowned girl or an unbaptized infant, she can take the form of either a long-haired young woman dressed in white or a naked hag.

Behavior

In pre-Christian Slavic tradition, she grants bountiful harvests if propitiated but also tickles men until they die or drowns them.



Kelpie

Habitat

Fast-moving streams in the northern British Isles, especially Scotland.

Appearance

In Gaelic Scottish myth, a horse that appears in a flash of lightning at night; sometimes it takes the form of a woman.

Behavior

Having lured an unsuspecting human onto its back, it sprints into deep water to drown and sometimes eat the rider. In 1786 the poet Robert Burns characterizes kelpies as agents of the devil.



Yacuruna

Habitat

Amazon River.

Appearance

Resembles a human, but with backward-facing head and feet.

Behavior

Kidnaps and marries humans, taking them to live in a sophisticated underwater city and teaching them magic and medicine. One Peruvian shaman suggests that Yacuruna moved underwater only in the early twentieth century to avoid being disturbed by radio waves.

1937: Los Angeles

FOOL ME ONCE

[Int. Council Chambers. Former mayor Sam Bagby is speaking. Behind him is a huge map, with overleafs and bold lettering: PROPOSED ALTO VALLEJO DAM AND RESERVOIR. Some of the councilmen are reading funny papers and gossip columns while Bagby is speaking.]

Bagby: Gentlemen, today you can walk out that door, turn right, hop on a streetcar, and in twenty-five minutes end up smack in the Pacific Ocean. Now you can swim in it, you can fish in it, you can sail in it—but you can't drink it, you can't water your lawns with it, you can't irrigate an orange grove with it. Remember—we live next door to the ocean, but we also live on the edge of the desert. Los Angeles is a desert community. Beneath this building, beneath every street, there's a desert. Without water the dust will rise up and cover us as though we'd never existed! *[pausing, letting the implication sink in]* The Alto Vallejo can save us from that, and I respectfully suggest that \$8.5 million is a fair price to pay to keep the desert from our streets—and not on top of them.

[An amalgam of farmers, businessmen, and city employees have been listening with keen interest. A couple of the farmers applaud. Somebody shushes them.]

Councilman: *[acknowledging Bagby]* Mayor Bagby...let's hear from the departments again. I suppose we better take Water and Power first. Mr. Mulwray.

[Mulwray walks to the huge map with overleafs. He is a slender man in his sixties who wears glasses and moves with surprising fluidity. He turns to a smaller, younger man, and nods. The man turns the overleaf on the map.]

Mulwray: In case you've forgotten, gentlemen, over five hundred lives were lost when

the Van der Lip Dam gave way—core samples have shown that beneath this bedrock is shale similar to the permeable shale in the Van der Lip disaster. It couldn't withstand that kind of pressure there. *[referring to a new overleaf]* Now you propose yet another dirt-banked terminus dam with slopes of two and one half to one, 112 feet high, and a twelve-thousand-acre water surface. Well, it won't hold. I won't build it. It's that simple—I am not making that kind of mistake twice. Thank you, gentlemen.

[Mulwray leaves the overleaf board and sits down. Suddenly there are some whoops and hollers from the rear of the chambers, and a red-faced farmer drives in several scrawny, bleating sheep. Naturally, they cause a commotion.]

Council President: *[shouting to farmer]* What in the hell do you think you're doing? *[as the sheep bleat down the aisles toward the council]* Get those goddamn things out of here!

Farmer: *[right back]* Tell me where to take them! You don't have an answer for that so quick, do you?

[Bailiffs and sergeants-at-arms respond to the imprecations of the council and attempt to capture the sheep and the farmers, having to restrain one who looks like he's going to bodily attack Mulwray.]

Farmer: *[through above, to Mulwray]* You steal the water from the valley, ruin the grazing, starve my livestock—who's paying you to do that, Mr. Mulwray, that's what I want to know!

Robert Towne, from Chinatown. Initially titled *Water and Power*, the film depicts the California water wars of the early twentieth century. The original ending saw the main antagonist, Noah Cross, murdered by his daughter Evelyn, but director Roman Polanski wanted a darker ending and altered the film so it ended with Evelyn's own death. Despite Towne's protestations that the now-iconic final line—"Forget it, Jake. It's Chinatown"—would be too melodramatic, Polanski got his way. Towne won Best Original Screenplay at the 1975 Academy Awards for his work.



View of a City Along a River, attributed to the workshop of Jan Brueghel the Elder, c. 1630.

1326: Syria

DESERT OASES

When the new moon of Shawwal appeared, the Hijaz caravan went out to the outskirts of Damascus and encamped at the village called al-Kiswah, and I set out on the move with them. We marched to the town of Bosra, and thence to the castle of al-Karak.

Al-Karak is one of the most marvelous, inaccessible, and celebrated of fortresses, and it is called the Castle of the Raven. The riverbed encircles it on all sides, and it has but one gate, the entrance to which is hewn in the living rock, as also is the entrance to its vestibule. The caravan stopped outside al-Karak for four days, at a place called al-Thaniyah, and made preparations for entering the wilderness. Thence we traveled to Ma'an, which is the last town in Syria, and descended through the Pass of al-Sawan into the desert, of which the saying

goes: he who enters it is lost, and he who leaves it is born. After a march of two days, we halted at Dhat Hajj, a place of subterranean waterbeds with no habitations, then on to Wadi Baldah (but there is no water in it), and then to Tabuk. This is the place that was raided by the Apostle of God (God bless and give him peace). It has a spring that used to yield a scanty supply of water, but when the Apostle of God went down to it and used it for his ablutions it gave an abundant flow of running water and continues to do so to this day, through the blessed power of the Apostle of God (God bless and give him peace). It is the custom of the Syrian pilgrims, on reaching the camping ground of Tabuk, to take their weapons and unsheath their swords, charge upon the camp and strike the palms with their swords, saying, "Thus did the Apostle of God enter it."

The huge caravan encamps near the spring referred to, and every one of them slakes his thirst from it. They remain here for four days to

rest themselves and to water the camels and lay in supplies of water for the fearsome wilderness between Tabuk and al-Ula. It is the practice of the water carriers to take up their positions at the sides of this spring, and they have tanks made of buffalo hides, like great reservoirs, from which they water the camels and fill the large water bags and ordinary water skins. Each emir or person of rank has a private tank from which his camels and those of his retinue are watered, and their water bags filled; the rest of the people arrange with the water carriers to water the camel and fill the water skin of each person for a fixed sum of money.

Human beings were invented by water as a device for transporting itself from one place to another.

—Tom Robbins, 1971

The caravan then sets out from Tabuk and pushes on speedily, night and day, for fear of this wilderness. Halfway through is the valley of al-Ukhaidir, which might well be the valley of hell (God preserve us from it). One year the pilgrims suffered severe distress in this place, by reason of the simoom wind that blows there, their water supplies dried up, and the price of a drink of water rose to a thousand dinars, but both seller and buyer perished. The story of this is inscribed on one of the rocks in the valley. Going on from there, the caravan halts at the Pool of al-Mu'azzam, a vast basin, called after al-Malik al-Mu'azzam of the house of Ayyub, in which the rainwater collects in certain years, but which is generally dry in others.

On the fifth day after leaving Tabuk, they reach the well of al-Hijr—the Hijr of Thamud—which has an abundance of water, but not one of the pilgrims draws of it, however violent their thirst, following the example set by the Apostle of God when he passed it by on the expedition to Tabuk. For he drove on his riding camel, giving orders that none should water from it, and those who had used it to make dough fed their camels with

it. At this place are the dwellings of Thamud, in some hills of red rock. They are hewed out and have carved thresholds, such that anyone seeing them would take them to be of recent construction. Their bones lie crumbling inside these houses—“verily, in that is a warning example.” The place of kneeling of the she-camel of Salih (on him be peace) is between two hills there, and in the space between them are the traces of a mosque, in which the pilgrims perform a prayer.

From al-Hijr to al-Ula is half a day's journey or less. Al-Ula is a large and pleasant village with palm gardens and water springs at which the pilgrims halt for the space of four nights. They provision themselves and wash their clothes, and also deposit here any surplus of provisions they may have, taking on with them only the amount of their strict necessities. The inhabitants of this village are trustworthy persons. This is the limit to which the Christian merchants of Syria may come, and beyond which they may not pass, and they trade in provisions and other goods with the pilgrims here.

The caravan then sets out from al-Ula and encamps on the day following the resumption of the journey in the valley known as al-Itas. It is a place of violent heat, in which the fatal simoom wind blows. It blew up one year on the caravan, and none but a few of the pilgrims escaped with their lives; that year is known as the year of the Emir al-Jaliqi. After this they encamp at Hadiyah, which is a place of subterranean water beds in a valley; they dig pits in it and the water comes up, but brackish. On the third day they alight outside the sanctified city of al-Madinah, the holy and illustrious.

Ibn Battuta, from his *Travels*. Born in 1304 in North Africa, Ibn Battuta left home at twenty-one to make a pilgrimage to Mecca; he ended up traveling for almost three decades, covering 75,000 miles. His *Travels*, published after his return, gained a wide and fervent readership. One Moroccan prince who read it a half millennium later annotated a passage about certain Indian women's “knowledge of erotic movements”; his marginalia reads, “O God, give me a taste of this delight.” Ibn Battuta's place of death is unknown. It is said to have occurred in “some town or other.”

1552: Bahamas

LES PÊCHEURS DE PERLES

One of the cruelest and most damnable things in the whole of creation is the way in which the Spanish use natives to fish for pearls. The life of a pearl fisher in these conditions is worse than any other on the face of the earth; it is even more dreadful and more terrible than that of the native gold miner, ghastly though that undoubtedly is. They are in the water from dawn to dusk, often operating at depths of four and five fathoms. Seldom are they permitted to surface for air but must spend their time swimming underwater and tearing at the oysters in which pearls grow. Once they have filled their nets, they surface, gasping, and hand the oysters

to the Spanish taskmaster who sits in a smack or a canoe. If they spend more than a few seconds at the surface to get their breath back, he will punch them or grab them by the hair and push them back under, making them dive once more. Their only food is fish—and then only oysters—plus, perhaps, some cassava bread (they bake with cassava flour throughout the region), the oysters providing little in the way of sustenance and the cassava being extremely hard to make. They are kept perpetually hungry. At night they are shackled to prevent them from escaping, and have to sleep on the hard ground. Often when out fishing or searching for pearls, a man will dive never to resurface, for the poor wretches are easy prey to all manner of sharks, those most ferocious of marine creatures, capable of swallowing a man whole.

Ochanomizu in the Rain, by Kuniyoshi, mid-nineteenth century.





Lagoon in Lençóis Maranhenses National Park, Maranhão, Brazil, 2008. Photograph by Bruno Barbey.

One can see just how closely the greed of those Spaniards involved in this profitable enterprise of pearl fishing induces obedience to God's commandment to love him and to love one's neighbor, for they place their fellow creatures in peril of both body and soul (the wretches dying without learning of Christ and without the benefit of the sacraments). On top of this, their victims are forced to spend their last days in agony, and the nature of the work is such that they perish in any case within a few days, for no man can spend long underwater without coming up for air, and the water is so cold that it chills them to the marrow. Most choke on their own blood, as the length of time they must stay underwater without breathing and the attendant pressure on their lungs makes them hemorrhage from the mouth; others are carried off by dysentery caused by the extreme cold to which they are subjected. Their hair, which is naturally jet-black, takes on a singed appearance more typical of sea wolves, and their backs come out in great salt sores, so that they look more like deformed monsters than men, or like members

of another species altogether. By condemning them to this quite unbearable toil—or to put it more accurately, this living hell—the oppressors have exterminated the entire population of the Bahamas, not a single soul living there when the Spanish first discovered this trade having survived. The pearl divers fetch fifty or a hundred *castilians* on the open market because of the great skill of Bahamians as swimmers, and they are sold despite an unusually enlightened ban on these auctions issued by the justices. The pearl fisheries have been the grave of countless non-Bahamians also, drafted in from other parts of the New World.

Bartolomé de Las Casas, from *A Short Account of the Destruction of the Indies*. *When he was eighteen years old, Las Casas left Spain for Santo Domingo, becoming, during his time in the New World, the rare Spanish-born advocate for the rights of indigenous people. In 1515 he was appointed priest-procurator of the Indies. Not long after, he attempted to establish a joint community of both natives and Spanish civilians. When the project failed, in 1522, Las Casas joined the Dominican order and became prior of the Convent of Puerto de Plata.*

2003: New York City

DAVID GRANN SEES THE END OF THE TUNNEL

I had only heard tales of New York City's invisible empire, an elaborate maze of tunnels that goes as deep as the Chrysler Building is high. Under construction in one form or another for more than a century, the system of waterways and pipelines spans thousands of miles and comprises nineteen reservoirs and three lakes. Two main tunnels provide New York City with most of the 1.3 billion gallons of water it consumes each day, 90 percent of which is pumped in from reservoirs upstate by the sheer force of gravity. Descending through aqueducts from as high as fourteen hundred feet above sea level, the water gathers speed, racing down to a thousand feet below sea level when it reaches the pipes beneath the city.

It is a third water tunnel, however, that is the most critical. Designed to meet expanding demand and to serve as a backup system in case something ever happens to City Tunnel No. 1 or City Tunnel No. 2, City Tunnel No. 3 has been under development since 1969, and was initially billed as "the greatest nondefense construction project in the history of Western civilization." Already, twenty-four people have died building it—roughly a man a mile—and it is not expected to be completed until 2020.

As an engineering feat, the water-tunnel system rivals the Brooklyn Bridge and the Panama Canal. Yet it has the odd distinction that almost no one will ever see it, save for the sandhogs who are building it. Over the years the men have constructed an entire city under the city, a subterranean world as cluttered as the Manhattan skyline: it includes 438 miles of subway lines, 6,000 miles of sewers, and thousands of miles of gas mains. "If it's deeper than a grave," sandhogs often say, "then we built it." The water tunnels have become the sandhogs' greatest and most elusive achievement, an often deadly effort that has consumed generations. "I'll take you down there if you want," Jimmy Ryan, president of the sand-

hogs' union, Local 147, had said when I asked him to show me the tunnel's newest section. "But, trust me, it ain't like Macy's down there."

The city's water system is deeply antiquated. The old tunnels, Ryan explained, were leaking "like a sieve"; some of the sections were built nearly a century ago and were in desperate need of repair. But until Tunnel No. 3 is virtually complete, there will be no way to fix them. In part, this is because getting inside Tunnel No. 1 or No. 2 would require the city to shut the water off, and without a backup supply, there would be serious water shortages. But it was more than that, and as several sandhogs peered over his shoulder, Ryan started to draw a circle on the table with his muddy finger. "See this?" he asked me. "These are the valves that control the flow of water."

"They're hundreds of feet underground," another sandhog said.

It is wretched business to be digging a well just as you're dying of thirst.

—Plautus, c. 193 BC

The valves were designed, Ryan said, to open and close guillotine-like gates inside the cylindrical tunnels, stopping the flow of water. But they had become so brittle with age that they were no longer operable. "They're afraid if they try to shut the valves, they won't be able to turn 'em back on," Ryan said.

He wiped some mud from his eyes. "Look," he said. "If one of those tunnels goes, this city will be completely shut down. In some places there won't be water for anything. Hospitals. Drinking. Fires. It would make September 11 look like nothing."

Many experts worry that the old tunnel system could collapse all at once. "Engineers will tell you if it fails, it will not fail incrementally," said Christopher Ward, the head of the city's Department of Environmental Protection, which is responsible for designing and operating the tunnel system. "It will fail catastrophically." If City Tunnel No. 1, which is considered the most vulnerable, caved in, all of

C. 350 BC: Athens

PRIMARY SOURCE

Of the first philosophers, most thought the principles that were of the nature of matter were the only principles of all things. Just so they say nothing else comes to be or ceases to be; for there must be some entity—either one or more than one—from which all other things come to be, it being conserved.

Yet they do not all agree as to the number and the nature of these principles. Thales, the founder of this type of philosophy, says the principle is water (for which reason he declared that the earth rests on water), getting the notion perhaps from seeing that the nutriment of all things is moist, and that heat itself is generated from the moist and kept alive by it (and that from which they come to be is a principle of all things). He got his notion from this fact, and from the fact that the seeds of all things have a moist nature, and that water is the origin of the nature of moist things.

Some think that even the ancients who lived long before the present generation, and first framed accounts of the gods, had a similar view of nature; for they made Ocean and Tethys the parents of creation, and described the oath of the gods as being by water, to which they give the name of Styx; for what is oldest is most honorable, and the most honorable thing is that by which one swears.

Aristotle, from the Metaphysics. Though Thales would have been familiar with ancient legends about water progenitors—including, as Hesiod reports in his Theogony, how Tethys “bore swirling rivers to her mate, Ocean”—Aristotle is clear in the Metaphysics that Thales’ views were not derived from mythology but constituted the foundation of natural philosophy. The first of the ancient Greek Seven Sages to have received that title, Thales originated the Milesian school of philosophy. He died in 546 BC, one year before his disciple Anaximander.

lower Manhattan and downtown Brooklyn, as well as parts of the Bronx, would lose its water supply. If the aqueducts gave out, the entire city would be cut off. “There would be no water,” Ward told me. “These fixes aren’t a day or two. You’re talking about two to three years.”

It is hard to imagine a city without water, its faucets empty, its hydrants dry, its plazas filled not with fountains but with citizens suffering

from diseases spread by dirt and desiccation—to imagine, as Charles Einstein put it in the title of his 1964 futuristic novel, *The Day New York Went Dry*.

For much of its history, however, New York was a parched city. Though surrounded by the sea, its principal supply of fresh water remained, as late as the eighteenth century, a single fetid pool in lower Manhattan called the Collect Pond. Human waste was dumped into it, along with the occasional dead body. Distribution of water was dominated by racketeers known as teamen, who roamed the streets with giant casks, gouging customers. In 1785, with the city’s population reaching nearly thirty thousand, the *New York Journal* published an open letter to government officials complaining that the water supply had become a “common sewer.” One daily newspaper declared that it was “sickly and nauseating,” adding, “The larger the city grows, the worse this evil will be.”

In the winter of 1834, the Common Council vowed to locate new sources of water. But before plans got under way, a fire broke out near Wall Street. Without enough water to extinguish it—the rivers were frozen solid—the flames leaped from roof to roof, carried by a gale-force wind. Within minutes the fire had spread from Exchange Place to Water Street, then on to Front and South Streets, and still onward. (The smoke was visible as far away as Philadelphia.) The fire burned for twenty-four hours, and after it had consumed nearly seven hundred buildings and caused such mass looting that the military was called in, roughly a third of New York City lay in ruins. One witness, who called it “the most awful calamity which has ever visited these United States,” wrote, “I am fatigued in body, disturbed in mind, and my fancy filled with images of horror which my own pen is inadequate to describe.”

And so at last the city began to construct its first aqueduct.

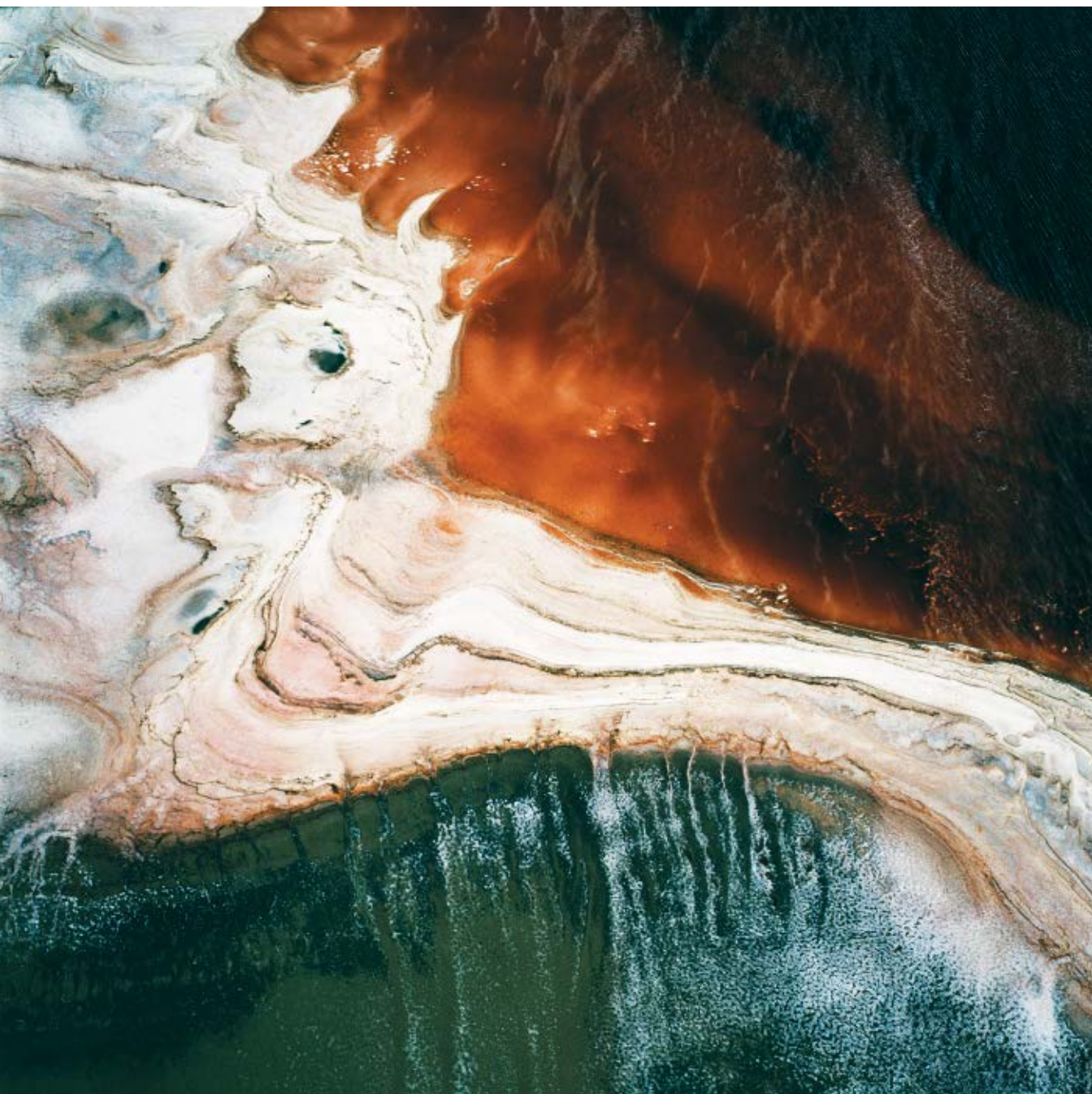
By today’s standards, the Croton Aqueduct is modest in scope, but at the time it was considered an architectural marvel. Begun in 1837 and completed in 1842, it extended more than thirty miles, running from the Croton Reservoir down the east bank of the Hudson River—an elegant,

eight-by-seven-foot brick pipeline. When it was finished, church bells rang out across the city and thousands poured into the streets to parade past new fountains, whose water sparkled in the sun. Philip Hone, who eventually became mayor of New York, wrote in his diary, "Nothing is talked of or thought of in New York but Croton water... 'Water! Water!' is the universal note which is sounded through every part of the city, and infuses joy and exultation into the masses."

Twelve years later, however, the city's demand for water again exceeded supply, and the pressure in the pipeline fell so low that the water could no longer reach the third story of a building. By 1882, with thousands of immigrants arriving each week, the *Times* pleaded MORE WATER WANTED, adding, "The health of families... was jeopardized because sufficient water could not be secured." Yet unlike the previous century, when the city had looked on

Terminal Mirage 14, by David Maisel, 2003.

Archival pigment print, 48 x 48 inches. From a series of aerial photographs of the Great Salt Lake.



impassively at civic problems, there was now an almost evangelical faith in human progress. In 1905, Mayor George McClellan, who had just inaugurated the city's first subway system, laid out a vision of "an additional supply of pure and wholesome water," a vision so bold that it struck many as evidence of hubris. At an estimated cost of \$185 million—\$3.7 billion in today's dollars—it would be the largest municipal water system in the world. In 1907, at the groundbreaking, McClellan declared, "The course of human events is not permanently altered by the great deeds of history, nor by the great men, but by the small daily doings of the little men."

The United States has virtually set up an empire on impounded and redistributed water.

—Charles P. Berkey, 1946

Before long, thousands of laborers arrived in the Catskill Mountains and began clearing away vegetation. Under the expansive McClellan Act, which one judge complained gave "power that the Almighty would not delegate to an archangel," the city appropriated more than 25,000 acres of land, including hundreds of homes around the area of Shokan, which is just south of Woodstock. Nine villages were torn down, some burned to the ground, and nearly three thousand residents driven out; even cemeteries were dug up. "The trees are all cut down, and the village is fading as a dream," the *Kingston Freeman* reported.

Then dams were built, water was diverted from streams in the Catskills, and rain was collected. The entire elevated basin was flooded, creating one of several reservoirs that, together, are nearly as large as the island of Manhattan. In photographs of the Shokan area taken before the flooding, the land is green and expansive; months later, it is covered by a glasslike inland sea.

Meanwhile, sandhogs burrowed through mountains and under hillsides to construct the Catskill Aqueduct, a ninety-two-mile conduit that slopes gently downhill from Shokan to Storm King Mountain and then down to White

Plains. At one point, it crosses below the Hudson River, at a depth of eleven hundred feet—an achievement that New York City's new mayor, William Gaynor, called "one of the greatest engineering feats in history." The hardest part of the project, however, was yet to come. According to the engineers' elaborate design, water would flow from the aqueduct into a reservoir in Yonkers. From there, it would be channeled into another tunnel—one dug deep beneath the city, and able to withstand the pressure of more than half a billion gallons coursing through it each day. This water would then begin flowing upward, into smaller and smaller pipes, ultimately discharging into the millions of faucets around the city. Construction on what become known as City Tunnel No. 1 began in 1911. Many men went down once and never went back. Those who stayed received about two dollars a day. Once, under the strain, a riot erupted twelve hundred feet underground, and workers attacked each other with picks and shovels.

It's not known how many sandhogs died building the Catskill system, but in 1913 the *Pine Hill Sentinel* reported, "Approximately ten out of every hundred workers are killed or injured every year. More than 3,800 accidents, serious and otherwise, to workers on the great aqueduct have been recorded... The men doing the rough work are virtually all foreigners or Negroes. Owing to the laborers being so inconspicuous, the death by accident of one or more of them attracts no public attention."

In 1917, more than a decade after the work began, the last explosion was sounded. It was now possible to walk underground from Manhattan all the way to the Catskills.

From "City of Water." In 2013, a decade after this story was published in The New Yorker, where Grann is a staff writer, the Manhattan leg of City Tunnel No. 3 was finally completed; another section of the tunnel, set to connect Brooklyn and Queens, won't be finished until the 2020s. At the opening ceremony for the tunnel, Mayor Michael Bloomberg noted that waterworks construction is "not sexy, and nobody says thank you." Grann's most recent book is Killers of the Flower Moon: The Osage Murders and the Birth of the FBI.



Garden with herms and a fountain, fresco from the House of the Golden Bracelet, Pompeii, c. 30.

1990: Istanbul

THE WASTE LAND

Did you know that the Bosphorus is drying up? I don't think so. Naturally, we're all preoccupied with this frenzied killing spree going on in our streets, and since we seem to enjoy it as much as fireworks, who has time to read or to find out what's going on in the world? It's hard even to keep abreast of our columnists—we read them as we struggle across our mangled ferry landings, as we huddle together at our overcrowded bus stops, as we sit yawning in those *dolmuş* seats that make every letter tremble. I found this story in a French geological journal.

The Black Sea, we are told, is getting warmer, the Mediterranean colder. As their waters continue to empty into the great caves whose gaping holes lie in wait under the seabed, the same tectonic movements have caused Gibraltar, the Dardanelles, and the Bosphorus to rise. After one of the last remaining Bosphorus fishermen told me how his boat had

run aground in a place where he had once had to throw in an anchor on a chain as long as a minaret, he asked, Isn't our prime minister at all interested in knowing why?

I didn't have an answer for him. All I know is that the water is drying up faster than ever, and soon no water will be left. What is beyond doubt is that the heavenly place we once knew as the Bosphorus will soon become a pitch-black bog, glistening with muddy shipwrecks baring their shiny teeth like ghosts. But at the end of a hot summer, it's not hard to imagine this bog drying up in some parts while remaining muddy in others, like the bed of a humble river that waters a small town in the middle of nowhere. Nor is it difficult to foresee daisies and green grass growing on slopes irrigated by thousands of leaking sewage pipes. Leander's Tower will at last become worthy of its name, terrifying us from its giddy heights; in the wild terrain beneath, a new life will begin.

I am speaking now of the new neighborhoods that will take root on this muddy wasteland that we once knew as the Bosphorus, even

as city councillors rush here and there waving penalty notices; I speak of shantytowns and shacks, bars, nightclubs, and amusement arcades, of rusty horse-drawn Lunaparks, of brothels, mosques, and dervish lodges, of nests where Marxist splinter groups go to hatch their young and rogue plastics factories turn out nylon stockings for the black market. Amid the doomsday chaos, among toppled wrecks of old City Line ferries, will stretch vast fields of bottle caps and seaweed. Adorning the mossy masts of American transatlantic liners that ran aground when the last of the water receded overnight, we shall find the skeletons of Celts and Ligurians, their mouths gaping open in deference to the unknown gods of prehistory.

These landscapes of water and reflection have become an obsession.

—Claude Monet, 1908

As this new civilization grows up amid mussel-encrusted Byzantine treasures, tin and silver knives and forks, thousand-year-old wine corks and soda bottles, and the sharp-nosed wrecks of galleons, I can also imagine its denizens drawing fuel for their lamps and stoves from a dilapidated Romanian oil tanker whose propeller has become lodged in the mud. But that is not the worst of it, for in this accursed cesspool watered by the dark-green spray of every sewage pipe in Istanbul, we can be sure that new epidemics will break out among the armies of rats as they explore their new heaven, this drying seabed strewn with turbot and swordfish skeletons and polluted with the mysterious gases that have been bubbling beneath the surface since long before the birth of history. This I know, and this I must impress upon you: the authorities will seek to contain the epidemic behind barbed wire, but it will touch us all.

As we sit on the balconies from which we once watched the moon glitter silver on the silken waters of the Bosphorus, we'll watch instead the blue smoke rising from the corpses we've had to burn in a hurry—leisurely buri-

als having become a thing of the past. As we sit along what once was the shore, at tables where once we drank raki amid the perfume of the Judas and honeysuckle blossoms, we will struggle to accustom ourselves to the acrid stink of rotting flesh. No longer will we soothe our souls with songs about the birds of spring, the fast-flowing waters of the Bosphorus, or the fishermen lining its shores; the air will ring instead with the anguished cries of men whose fear of death has driven them to smite their foes with the knives, daggers, bullets, and rusting scimitars that their forefathers, hoping to fend off the usual thousand-year inquiries, tossed into the sea. As for the Istanbulis who once lived on the edge of the water, when they return to their homes exhausted of an evening, they will no longer open bus windows to drink in the sea air; instead, they'll stuff newspaper and cloth in the cracks to keep the stink of rotting flesh and mud from seeping in; they'll sit there staring through the glass at the flames that rise from the fearsome black chasm gaping below. Those seaside cafés where balloon and wafer halvah vendors once wandered among us? No longer shall we sit there of an evening to feast our eyes on naval fireworks; instead, we'll watch the bloodred fireballs of exploding mines that carry with them the shattered remains of the curious children who set them off. Those men who once earned their keep by combing the sands for the Byzantine coins and empty tin cans washed in by stormy seas? They'll take to collecting the coffee grinders, the moss-covered cuckoo clocks, the black mussel-encrusted pianos that a long-ago flood plucked from the wooden houses that once lined the shore.

Orhan Pamuk, from *The Black Book*. Awarding Pamuk the 2006 Nobel Prize in Literature, the Swedish Academy praised his “quest for the melancholic soul of his native city” of Istanbul, where he was born in 1952 and studied painting, architecture, and journalism before publishing his first novel at age thirty. A dedicated swimmer, Pamuk has described the sea around Istanbul as “a large and terrifying world full of chemical salts, weird insects, crusty creatures, and poisonous fish.”

c. 500: China

RAPIDS RESPONSE

For the 240 miles of the Three Gorges, mountains stretch along both banks without break. Layers of peaks, ridges upon ridges, hide the sky and block out the sun. Midday and midnight are the only times the sun and moon become visible. When summer arrives, the level of the water rises up the hillside so that the boats are prevented from traveling upstream and downstream. Sometimes, when the emperor issues an urgent decree, it is possible to set out from the White Emperor's Citadel in the morning and arrive in Jiangling by evening. For the four-hundred-mile journey, riding a swift horse or flying on the wind cannot match the speed of a boat!

When winter turns to spring, there are white torrents and emerald depths; reflections appear upside down in the swirling eddies. Many oddly shaped junipers grow forth from jagged mountain peaks from which waterfalls plummet clamorously. Pure, verdant, lofty, flourishing—such qualities provide innumerable kinds of fascination. After a storm has cleared, or on frosty mornings, among forests chilled and streams desolate, the loud cry of a gibbon is often heard, prolonged and mournful. As it echoes through the empty valleys, its despairing wail lingers before disappearing. So the fishermen sing,

Of the Three Gorges in Eastern Ba

Shaman Gorge is the longest.

Three cries of the gibbon

And one's clothes become drenched
with tears.

Aestas, from the series The Seasons, engraving by Pieter van der Heyden after Pieter Bruegel the Elder, 1570.



The Long River flows farther eastward, past Wolf's Tail Rapids and by Men Rapids. Yuan Shansong said, "These two rapids are almost a mile apart. The water at Men Rapids is formidable and treacherous. The south bank contains granite rocks that are submerged in summer but emerge in winter. These rocks tower above. For several tens of paces, they form the shape of men's faces, some large, some small. And some are so clearly defined that even whiskers and hair are distinguishable. Thus it is called Men Rapids."

Water is the most beautiful element and rich in usefulness, and purifies from all filth, and not only from the filth of the body but from that of the soul.

—John of Damascus, c. 743

The Long River flows farther eastward, past the foot of Ox Mountain, where there is a rapids named Ox Rapids. On the southern bank, layers of ridges rise up with tall cliffs interspersed by the riverbank. There is a rock whose colored surface resembles a man carrying a sword on his back as he leads an ox. The man is in black, and the ox in yellow, clearly defined. Since there is no way to reach it, one cannot investigate it closely. This cliff is quite high, and in addition, the current is swift and winding; one can continue to view this phenomenon while traveling for two days along this route. Therefore, travelers sing a song that goes:

Mornings, we set out from the Ox;
Evenings, we spend by the Ox.
For three mornings and three evenings,
The Ox stays the same.

It means that the route twists around as it progresses, so the view seems to remain unchanged.

The Long River flows farther eastward past West Mount Gorge. *A Record of I-tu* says,

As one enters from Ox Rapids eastward into the area of West Mount Gorge, it is more than thirty miles to the mouth of the

gorge. Both the mountains and the water twist and turn, while along both banks are tall mountains forming layers of screens. Only at noon and at midnight can one see the sun and the moon. The sheer cliffs may be more than a thousand *zhang* high. The color of the rocks and their shapes, for the most part, resemble various kinds of things. The trees are tall and flourishing and generally endure the winter. The cries of gibbons are quite clear and echo through the valleys, vividly and without cease. This is one of what is known as the "Three Gorges."

Yuan Shansong stated that he had often heard of the perilous water throughout the gorges. All the written records and oral accounts cautioned travelers and warned them—none ever praised the beauty of the scenery. Then I came to visit this area. After arriving, I happily realized that hearing is not as good as personally observing. Its layered crags and graceful peaks, of unique construction and unusual shape, are indeed difficult to describe. Its forests and trees form intricate woods, randomly rooted and densely flourishing, which protrude above the mists. As I gazed up and peered down, it grew ever more familiar and ever more beautiful. I lingered and spent two nights there, forgetting about returning. For what I saw with my own eyes was a sight hitherto unknown to me. I am delighted to have experienced these unique sights. And if this landscape has a soul, it ought to be surprised to find that it has finally encountered a true admirer for the first time in history.

Li Daoyuan, from *Commentary on the Waterways Classic*. *Having traveled extensively as a child, Li felt that existing accounts of Chinese geography were rudimentary, and he hoped "to identify places through their waterways and, through these places, to preserve antiquity."* In 2003, after nine years of construction, a dam over Three Gorges began operating. The world's largest hydropower project, it displaced more than 1.2 million people, flooded more than a thousand villages, and has been considered the most environmentally destructive dam ever built.



The Floating Feather (detail), by Melchior de Hondecoeter, c. 1680.

1837: Lake Huron

SPARKLING WATERS

Now to take things in order, and that you may accompany us in our canoe voyage, I must describe in the first place our arrangements. You shall confess ere long that the Roman emperor, who proclaimed a reward for the discovery of a new pleasure, ought to have made a voyage down Lake Huron in a birch-bark canoe.

There were two canoes, each five-and-twenty feet in length and four feet in width, tapering to the two extremities, and light, elegant, and buoyant as the sea mew when it skims the summer waves. My blankets and night gear being rolled up in a bundle, served for a seat, and I had a pillow at my back; and thus I reclined in the bottom of the canoe, as in a litter, very much at my ease; my companions were almost

equally comfortable. I had near me my cloak, umbrella, and parasol, notebooks and sketch-books, and a little compact basket always by my side, containing eau de cologne, and all those necessary luxuries which might be wanted in a moment, for I was well resolved that I would occasion no trouble but what was inevitable. The voyageurs were disposed on low wooden seats, suspended to the ribs of the canoe, except our Indian steersman, Martin, who, in a cotton shirt, arms bared to the shoulder, loose trousers, a scarlet sash around his waist, richly embroidered with beads, and his long black hair waving, took his place in the stern, with a paddle twice as long as the others.

We started off in swift and gallant style, looking grand and official, with the British flag floating at our stern. Major Anderson and his people, and the schooner's crew, gave us three cheers. The Indians uttered their wild cries and

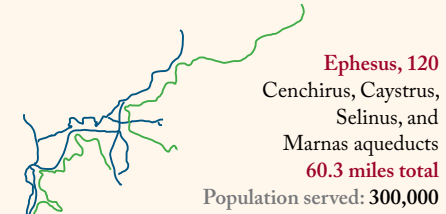
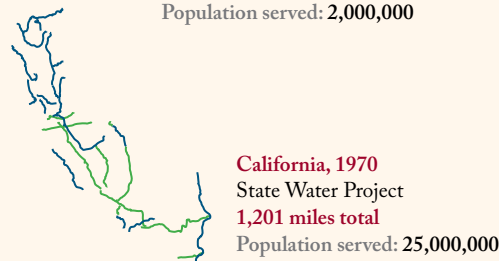
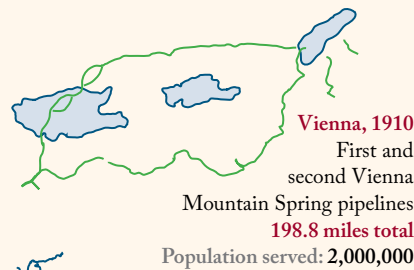
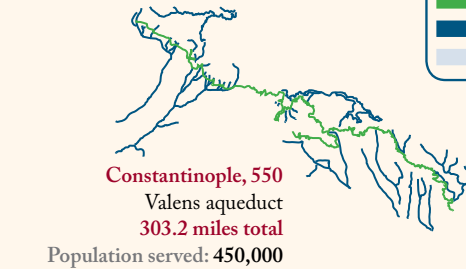
Water Lines

Quenching urban thirst throughout history

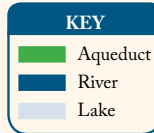
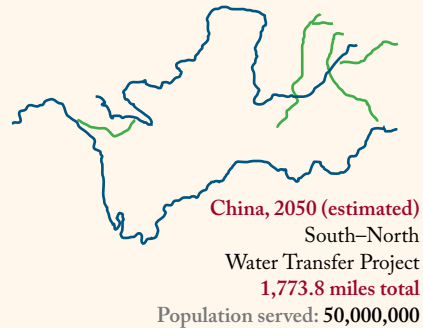
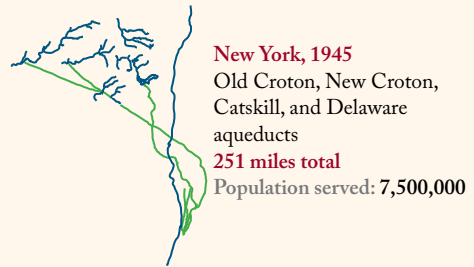
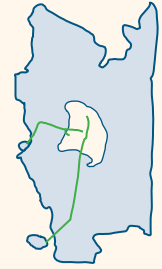
Rome, 100

Appia, Anio Vetus, Marcia, Tepula, Julia, Virgo, Alsietina, Claudia, and Anio Novus aqueducts
250.9 miles total

Population served: 1,000,000



Tenochtitlán, 1502
Chapultepec and Coyoacán aqueducts
10 miles total
Population served: 400,000



discharged their rifles all along the shore. As we left the bay, I counted seventy-two canoes before us, already on their homeward voyage—some to the upper waters of the lake—some to the northern shores; as we passed them, they saluted us by discharging their rifles. The day was without a cloud, and it was altogether a most animated and beautiful scene.

Later we bought some black bass from an Indian who was spearing fish, and apropos, I

never yet have mentioned what is one of the greatest pleasures in the navigation of these magnificent upper lakes—the purity, the coldness, the transparency of the water. I have been told that if in the deeper parts of the lake a white handkerchief be sunk with the lead, it is distinctly visible at a depth of thirty fathoms—we did not try the experiment, not being in deep water; but here, among shoals and islands, I could almost always see the rocky bottom, with

glittering pebbles, and the fish gliding beneath us with their waving fins and staring eyes—and if I took a glass of water, it came up sparkling as from the well at Harrowgate, and the flavor was delicious. You can hardly imagine how much this added to the charm and animation of the voyage.

About sunset we came to the hut of a fur trader, whose name, I think, was Lemorondière; it was on the shore of a beautiful channel running between the mainland and a large island. On a neighboring point, Wai-sow-win-de-bay (the Yellowhead) and his people were building their wigwams for the night. The appearance was most picturesque, particularly when the campfires were lit and the night came on. I cannot forget the figure of a squaw, as she stood, dark and tall, against the red flames, bending over a great black kettle, her blanket trailing behind her, her hair streaming on the night breeze—most like to one of the witches in *Macbeth*.

We supped here on excellent trout and whitefish, but the sand flies and mosquitoes were horridly tormenting; the former, which are so diminutive as to be scarcely visible, were by far the worst. We were off next morning by daylight, the Yellowhead's people cracking their rifles by way of salute.

The voyageurs measure the distance by pipes. At the end of a certain time there is a pause, and they light their pipes and smoke for about five minutes, then the paddles go off merrily again, at the rate of about fifty strokes in a minute, and we absolutely seem to fly over the water. "*Trois pipes*" are about twelve miles. We breakfasted this morning on a little island of exceeding beauty, rising precipitately from the water. In front we had the open lake, lying blue and bright and serene under the morning sky, and the eastern extremity of the Manitoolin Island; and islands all around as far as we could see. The feeling of remoteness, of the profound solitude, added to the sentiment of beauty; it was nature in her first freshness and innocence, as she came from the hand of her Maker, and before she had been sighed upon by humanity—defiled at once, and sanctified by the contact.

We landed at sunset on a flat ledge of rock, free from bushes, which we avoided as much as possible, from fear of mosquitoes and rattlesnakes, and while the men pitched the marquees and cooked supper, I walked and mused.

I wish I could give you the least idea of the beauty of this evening; but while I try to put in words what was before me, the sense of its ineffable loveliness overpowers me *now* even as it did then. The sun had set in that cloudless splendor, and that peculiar blending of rose and amber light that belongs only to

The smell of rain is rich with life.

—Estela Portillo Trambley, 1975

these climes and Italy; the lake lay weltering under the western sky like a bath of molten gold; the rocky islands which studded its surface were of a dense purple, except where their edges seemed fringed with fire. They assumed, to the visionary eye, strange forms; some were like great horned beetles, and some like turtles, and some like crocodiles, and some like sleeping whales, and winged fishes. The foliage upon them resembled dorsal fins, and sometimes tufts of feathers; then, as the purple shadows came darkening from the east, the young crescent moon showed herself, flinging a paly splendor over the water. I remember standing on the shore, "my spirits as in a dream were all bound up," and overcome by such an intense feeling of *the beautiful*, such a deep adoration for the power that had created it, I must have suffocated if——

But why tell *you* this?

Anna Jameson, from *Winter Studies and Summer Rambles in Canada*. "A little ill-built town on lowland, at the bottom of a frozen bay," wrote Jameson, a Dublin-born art historian, Shakespeare scholar, biographer, and memoirist, upon arriving in Toronto in 1836 from London. "I did not expect much; but for this I was not prepared." She embarked on a journey through the southwestern part of the province the next summer, then published this account—written in the form of a journal to an absent friend—after arriving back in England in 1838.

2000: Cochabamba

RISING PRICE

The repression began at nine in the morning on Friday, February 4, at the four cardinal points of the city, where different columns of marchers had massed. The soldiers did not allow us to move even two hundred meters before they started firing tear gas and using their clubs. People outmaneuvered them in key zones, however, and were able to advance to within two blocks of the plaza. As the police retreated from that area, we saw how the downtown residents, who had been watching from their

*Till taught by pain,
Men really know not what good water's worth.*
—Lord Byron, 1819

windows, began to identify with the protesters from the countryside. The protesters cried, “We’re fighting for you. Your water rates have risen. Come and join us in the streets!”

One incident stands out in my memory as an example of this. We were trying to escape from the tear gas, and we knocked on a door to ask for a little water. With great fear a whole family opened their home, and a group of us went in. We told them why we were fighting: “For control of the water system. They’ve raised your rates, too. We have to get out and fight them—it’s the only way.” Back in the streets, a little while later we noticed that all of the family members were there with buckets of water from which people could drink or wash off the tear gas. Soon after that, we saw the whole family on the street corner where the worst of the fighting happened. There they were—with baking soda painted on their faces, with bandanas soaked in vinegar, with rocks, with everything. They had joined the fight.

This happened all across the city. People began to involve themselves in the struggle. I remember on one corner we asked some bank employees for paper to burn. “Paper, paper!” we yelled, because burning paper helps to reduce

the effect of the gases. And the “suits” who were watching the street action from behind closed windows opened them and began to shower us with bank stationery, computer paper, printing paper, and whole boxes of paper from the Banco Económico. The people shouted back, “Bravo! Long live the bank!” It was amazing how people got involved.

Friday’s battle was exhausting. There were moments of ad hoc truce, when both the police and citizens sat down or lay out on the pavement. We said to ourselves, “No one will demonstrate tomorrow.” But something had deeply wounded the people, a series of things that they felt inside and could not forget. We made our way downtown on Saturday, February 5, thinking no one was going to show up.

As we walked, however, we soon realized that the entire city was blockaded. The citizens had armed themselves with bricks and stones, and television cameras were broadcasting everything live. People watching at home responded, saying, “This can’t be,” and they marched out to join in. We had guessed that nothing would happen that day, but then we heard ordinary people being interviewed on the radio saying things like: “We’ve got to take to the streets,” “They’ve unleashed the *dálmatas* against us,” and “We can’t let them get away with beating us.” I think the press played a huge role on Saturday, because it revealed to the populace what was going on in the city.

The *dálmatas*—the motorcycle cops—had really upset the population, and, I think, this was the government’s first big mistake. People had hurled insults at the *dálmatas*, saying, “Go to hell, you bastards, you pricks. Go back to La Paz, you cholos! Let our own police beat us, not you!” People simply would not put up with La Paz police being sent to attack the Cochabambinos.

The second day people came out to demonstrate with more strength than ever. The *cocaleros*’ [coca growers] actions were decisive, for they were the first to take up positions and to erect the barricades anew. We witnessed so many interesting things. For example, on one

street—an isolated street where surely nothing was going to happen—we saw a barricade made out of sticks and bricks all arranged in a pattern, as if it were a game. And in the middle of it there was a child-size bicycle. The whole structure of the barricade emanated from it. Kids had built this!

As we passed by, the children called out to us, “Be careful, *compañero* Olivera. Be careful not to puncture a tire.” That’s when we noticed that they had placed some shreds of paper with tacks in the street—and this on a street that hardly anyone ever came down!

That Saturday the action unfolded mainly in the center of the city, but everyone assigned themselves a role. The young men were fighting the police downtown. There were a group of elderly people—I remember this very well—on a street three hundred meters away from any

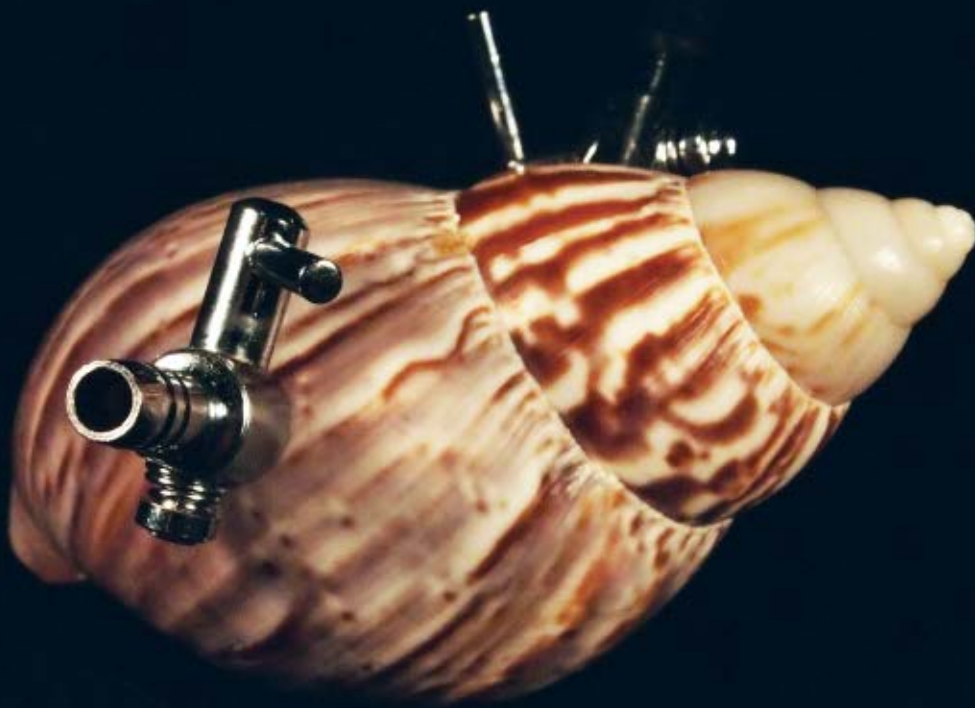
of the struggle. They were out in the middle of the street banging on pots. “We’ve got to do something,” they told us. “We old women can’t get downtown by ourselves anymore. But at least we can make some noise.” And you saw kids who were five, six, seven years old carrying trunks out of their houses to put in the street, or to fill with stones. The event had become contagious, with everyone saying, “Enough!”

The agreement that was finally signed by the government on Sunday, February 6, contained something we had not expected: a freeze on the rate hikes. We gave the government two months to enact the agreement. This really gave the people a sense of strength and energy.

In March 2000 we organized a *consulta popular* (popular referendum) which was the first in the country’s history. More than fifty thousand people cast votes on a purely voluntary basis.

Sublime: The L.A. River #9, by Elena Dorfman, 2015.





Breathing Apparatus for Land Mollusks, by Jonathon Keats, 2015–17. The artist's speculative design for technology to enable land snails to escape into the ocean in case of extreme acid rain.

This exercise in participatory democracy clearly stated that the water company Aguas del Tunari had to go and that Law 2029, which enabled the privatization of our water, had to be changed.

Around the middle of March, however, we began to understand that the government had no intention of conceding anything. The congressional members had said they would consider our proposal to modify the water law, not that they would change it. And on the question of the contract with Aguas del Tunari, they vowed they would change nothing. In effect, the government ignored our demands. So we increased them. It was no longer enough simply to revise the contract, now Aguas del Tunari had to leave Cochabamba. And we wanted the water law *changed*, not considered. The government then moved to discredit us, claiming that, because of the participation of the cocaleros in the Coordinadora de Defensa del Agua y de la Vida (Coalition in Defense of Water and Life), we were involved in the drug trade. The government portrayed us as just a gang of vandals bent on destroying things.

Two months passed and the April 4 deadline arrived with no progress. Since the government refused to act, we had to. What became known as the “Last Battle” took place over the course of eight days, during which blockades cut off the main highway, and masses of protesters occupied the city center. On the final day, we would mobilize a hundred thousand people and win the expulsion of Aguas del Tunari. We would also win a drastic modification of Law 2029 based on a proposal put forth by the Coordinadora. After fifteen years of defeats, the April days would come to represent the first victory of the people against the neoliberal model.

Oscar Olivera, from ¡Cochabamba! Water War in Bolivia. In 1999 the Bolivian government sold off Cochabamba's water to Aguas del Tunari, the lone bidder. The terms of the deal gave the consortium control of water systems at every level, including community wells. A subsequent hike in water prices quickly resulted in an uprising. Oscar Olivera, a former shoemaker, led the Coalition in Defense of Water and Life movement and published this account of the struggle, written in collaboration with Tom Lewis, Latin American editor for the International Socialist Review.

c. 1050: Heian-kyo

THE SHAPE OF WATER

First, the direction of a garden stream source must be determined. According to the scriptures, the proper route for water to flow is from east to south and then toward the west. Flowing from west to east is considered a reverse flow, thus a flow from east to west is standard practice. In addition, bringing water out from the east, causing it to flow under one of the residence halls, and then sending it off to the southwest is considered the most felicitous. This is because the waters from the Blue Dragon will wash all manner of evil off to the Great Path of the White Tiger. The master of a household who does this will avoid sickness and tumors, be of sound health, and lead a long and happy life.

When one is trying to select a site with correct geomantic conditions, remember that the place on the left side where water runs from is called the Land of the Blue Dragon. Similarly, water should run from the east of the main hall or outer buildings, then turn south, and finally flow out to the west. In the case of water that flows from the north, the stream should first be brought around to the east and then caused to flow to the southwest.

According to the scriptures, the inner curve of the garden stream is considered to be the belly of the dragon, and it is considered felicitous to build one's home there. Conversely, the outside of the curve—the dragon's back—is considered to be unlucky. There is also a theory of sending water from north to south because north is the water direction while south is that of fire. In other words, one should send yin in the direction of yang, and thus by facing the two forces against each other, create a state of harmony. Considered in this way, the notion of sending water directly from north to south is not without merit indeed.

The idea of water running to the east comes from the Well of the Turtle at Shiten-ji Temple. According to the records of the

Great Master, the spirit waters guarded by the Blue Dragon run to the east. If this is true, then the eastward direction of a reverse flow would also be felicitous. When the master of Buddhist law was searching for a felicitous place on Mount Koya, an old man appeared to him. The master asked the old man if he knew of a place in the area that would be good for building a temple. The old man answered, "Right in the middle of my lands, there is a special place shrouded in purple mist by day. In the evening there is a Goyo pine that emits a mysterious light, and all the water there runs to the east. A place fit for a castle if there ever was."

A fountain of water is all ball bearings, so perfect in function that it requires no lubrication. Water is the only substance friction will not wear out.

—Malcolm de Chazal, 1948

In fact, the idea that all water should run to the east stems from the concept of the eastern flow of Buddhism. If this is true, it follows that such noble places are not appropriate for mere residences.

It has been said that when making a garden, deep spiritual concentration is required. Earth is lord, water servant. If earth permits it, water will flow, but if earth prevents it, it will not. Seen another way, mountain is lord and water the servant, while stones are the lord's counselors. Water thus flows in accordance with the nature of the mountain. However, if the mountain is weak, it will be destroyed by water without fail, like a servant opposing a lord. The mountain is weak where there are no stones to lend it support, just as the lord is weak when he lacks supporters. Therefore, the mountain is complete when it contains stones, even as the lord rules by the support of his servants. This is why stones are imperative when making a garden.

No matter which direction the source of the water is in, a stream should not be made to appear contrived, but rather it should flow



The Titan's Goblet (detail), by Thomas Cole, 1833.

this way and that, from the edge of one hill to the edge of another. Dig the water channel in such a way as to create a stream that flows in a captivating manner.

Regarding stones in the garden stream, stones should not all be set in a similar manner and crammed together. The first place to set a stone is where the flow bends sharply. In nature, water bends because there is a stone in the way that the stream cannot destroy. Where the water flows out of a bend, it flows with great force. As it runs diagonally, consider

where the water would strike an obstacle most powerfully. That point is where you should set a turning stone.

Tachibana no Toshitsuna, from the *Sakuteiki*. *Thought to be the world's oldest gardening treatise, the Sakuteiki, "Records of Garden Making," was written during the Heian period, when traditions that had been imported from China and Korea were under widespread reevaluation. It is attributed to Tachibana, the son of an imperial regent and a member of one of the era's Four Great Families who served as head of construction and repairs for imperial estates, which included the creation of many gardens.*

1903: Mojave Desert

FACTS ON THE GROUND

By the end of the dry season, the water trails of the Ceriso are worn to a white ribbon in the leaning grass, spread out faint and fanwise toward the homes of gopher and ground rat and squirrel. But however faint to man-sight, they are sufficiently plain to the furred and feathered folk who travel them. Getting down to the eye level of rat- and squirrel-kind, one perceives what might easily be wide and winding roads to us if they occurred in thick plantations of trees three times the height of a man. It needs but a slender thread of barrenness to make a mouse trail in the forest of the sod. To the little people, the water trails are as country roads, with scents as signboards.

There is little water in the Ceriso at the best of times, and that little brackish and smelling vilely, but by a lone juniper where the rim of the Ceriso breaks away to the lower country, there is a perpetual rill of fresh, sweet drink in the midst of lush grass and watercress. In the dry season there is no water else for a man's long journey of a day. East to the foot of Black Mountain, and north and south without counting, are the burrows of small rodents, rat- and squirrel-kind. Under the sage are the shallow forms of the jackrabbits, and in the dry banks of washes, and among the strewn fragments of black rock, lairs of bobcat, fox, and coyote.

The coyote is your true water witch, one who snuffs and paws, snuffs and paws again at the smallest spot of moisture-scented earth until he has freed the blind water from the soil. Many water holes are no more than this detected by the lean hobo of the hills in localities where not even an Indian would look for it.

It is the opinion of many wise and busy people that the hill folk pass the ten-month interval between the end and renewal of winter rains with no drink; but your true idler, with days and nights to spend beside the water trails, will not subscribe to it. The trails begin, as I said, very far back in the Ceriso,

faintly, and converge in one span broad, white, hard-trodden way in the gully of the spring. And why trails if there are no travelers in that direction?

I have yet to find the land not scarred by the thin, far roadways of rabbits and whatnot of furry folks that run in them. Venture to look for some seldom-touched water hole, and so long as the trails run with your general direction, make sure you are right, but if they begin to cross yours at never so slight an angle, to converge toward a point left or right of your objective, no matter what the maps say, or your memory, trust them; they *know*.

It is very still in the Ceriso by day, so that were it not for the evidence of those white beaten ways, it might be the desert it looks. The sun is hot in the dry season, and the days are filled with the glare of it. Now and again some unseen coyote signals his pack in a long-drawn, dolorous whine that comes from no determinate point, but nothing stirs much before midafternoon. It is a sign when there begin to be hawks skimming above the sage that the little people are going about their business.

The coyotes that are astir in the Ceriso of late afternoons, harrying the rabbits from their shallow forms, and the hawks that sweep and swing above them, are not there from any mechanical promptings of instinct but because they know of old experience that the small fry are about to take to seed gathering and the water trails. The rabbits begin it, taking the trail with long, light leaps, one eye and ear cocked to the hills from whence a coyote might descend upon them at any moment. Rabbits are a foolish people. They do not fight except with their own kind, nor use their paws except for feet, and appear to have no reason for existence but to furnish meals for meat eaters. In flight they seem to rebound from the earth of their own elasticity but keep a sober pace going to the spring. It is the young watercress that tempts them and the pleasures of society, for they seldom drink. Even in localities where there are flowing streams, they seem to prefer the moisture that collects on herbage, and after rains

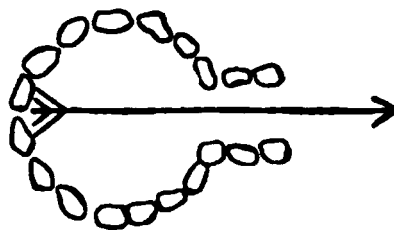
may be seen rising on their haunches to drink delicately the clear drops caught in the tops of the young sage. But drink they must, as I have often seen them mornings and evenings at the rill that goes by my door. Wait long enough at the Lone Tree Spring and sooner or later they will all come in.

The crested quail that troop in the Ceriso are the happiest frequenters of the water trails. There is no furtiveness about their morning drink. About the time the burrowers and all that feed upon them are addressing themselves to sleep, great flocks pour down the trails with that peculiar melting motion of moving quail, twittering, shoving, and shouldering. They splatter into the shallows, drink daintily, shake out small showers over their perfect coats, and melt away again into the scrub, preening and pranking, with soft contented noises.

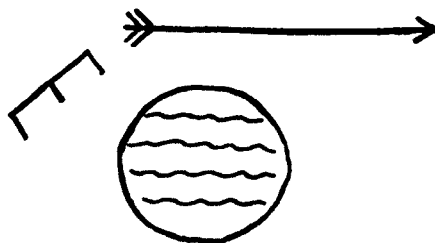
After the quail, sparrows and ground-inhabiting birds bathe with the utmost frankness and a great deal of splutter; and here, in the heart of noon, hawks resort, sitting panting, with wings aslant, and a truce to all hostilities because of the heat. One summer there came a roadrunner up from the lower valley, peeking and prying, and he had never any patience with the water baths of the sparrows. His own ablutions were performed in the clean, hopeful dust of the chaparral; and whenever he happened on their morning splatterings, he would depress his glossy crest, slant his shining tail to the level of his body, until he looked most like some bright venomous snake, daunting them with shrill abuse and feint of battle. Then suddenly he would go tilting and balancing down the gully in fine disdain, only to return in a day or two to make sure the foolish bodies were still at it.

Out on the Ceriso about five miles, and wholly out of sight of it, near where the immemorial foot trail goes up from Saline Flat toward Black Mountain, is a water sign worth turning out of the trail to see. It is a laid circle of stones large enough not to be disturbed by any ordinary hap, with an opening flanked by two parallel rows of similar stones, between

which, were an arrow placed touching the opposite rim of the circle, it would point as the crow flies to the spring. It is the old, in-



dubitable watermark of the Shoshones. One still finds it in the desert ranges in Salt Wells and Mesquite valleys, and along the slopes of Waban. On the other side of Ceriso, where the black rock begins, about a mile from the spring, is the work of an older, forgotten people. The rock hereabout is all volcanic, fracturing with a crystalline whitish surface, but weathered outside to furnace blackness. Around the spring, where must have been a gathering place of the tribes, it is scored over with strange pictures and symbols that have no meaning to the Indians of the present day; but out where the rock begins, there is carved into the white



heart of it a pointing arrow over the symbol for distance and a circle full of wavy lines reading thus: "In this direction three [units of measurement unknown] is a spring of sweet water; look for it."

Mary Austin, from *The Land of Little Rain*. After moving to California on her graduation from Blackburn College in 1888, Austin developed an affinity for the desert area of Owens Valley. "The real heart and core of the country are not to be come at in a month's vacation," she writes in the preface to this, her first book. "One must summer and winter with the land and wait its occasions." An active Fabian socialist, Austin died in 1934 in Santa Fe.

1943: The Fens

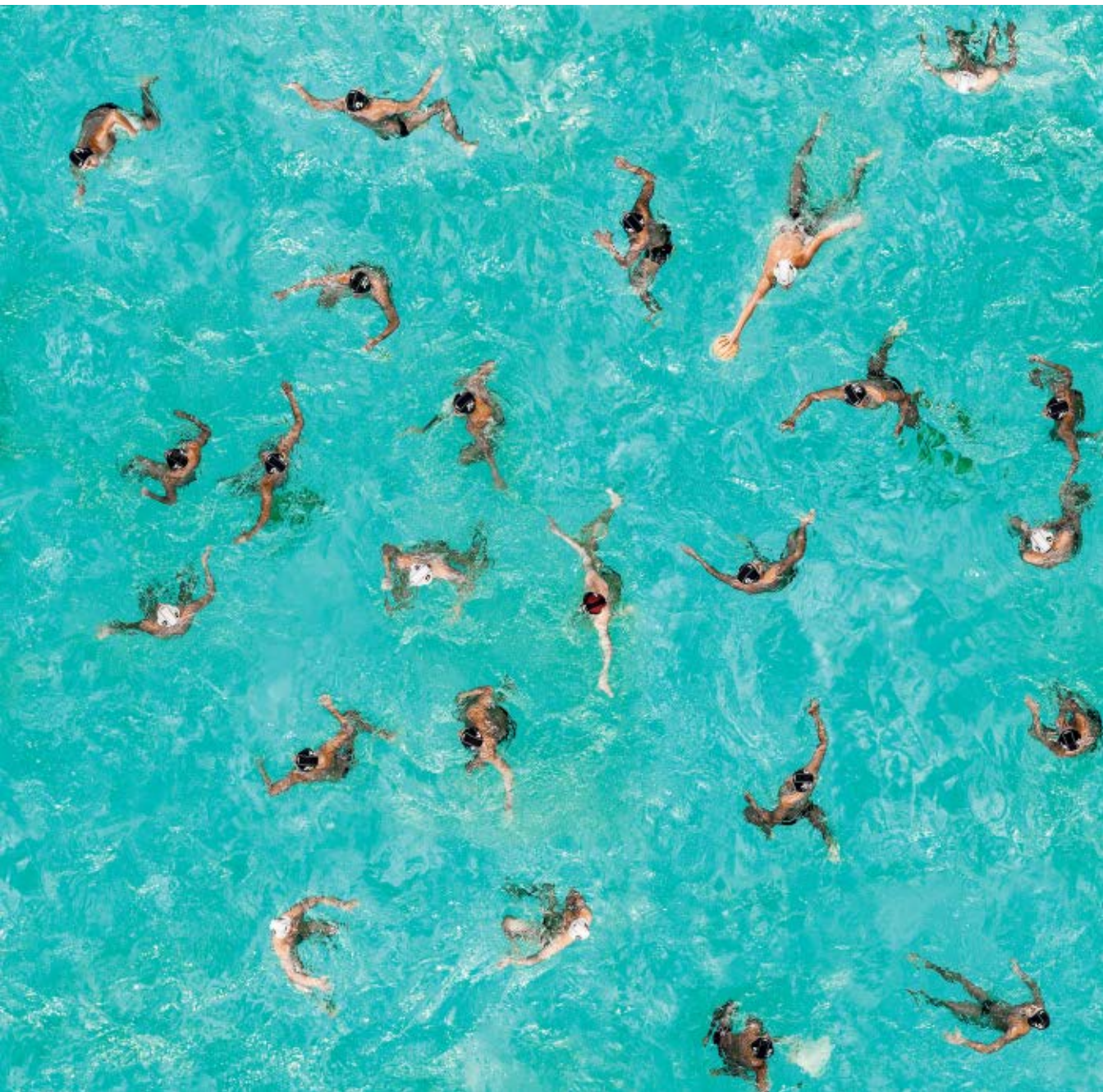
SAME RIVER TWICE

Once upon a time there was a river which flowed into another river which one day men would call the Rhine. But in those days there were no men, no names, and no North Sea and no island called Great Britain and the only beings who knew this river which followed into the nameless Rhine were the fish which swam

up and down it and the giant creatures which browsed in its shallows and whose fantastic forms we might never have guessed at were it not for the fact that now and then they lay down to die in circumstances that would preserve their fossilized bones and so, millions of years later, became a subject for human inquiry.

Then there was an ice age, or, to be precise, a series of glacial advances and withdrawals, during which time the sea interposed itself between the conjunctive Ouse and Rhine, and

Timeline - Waterpolo 3, by Mario Arroyave, 2013.



the land mass later known as Great Britain began to detach itself from the continent. And during this same lengthy period the first men, or their apelike ancestors, coming from no one knows exactly where, perhaps from Africa, perhaps from China, or even, by way of an evolutionary detour, out of the sea, migrated across the continental shelf and began to inhabit this not yet severed peninsula, thus setting a precedent many times to be followed, but for the last time successfully in 1066.

What these first men and their waves of successors called the Ouse we have no idea, having no inkling of their language. But how the Ouse regarded (for let us adopt the notion of these primitive peoples who very probably thought of the Ouse as a god, a sentient being) these two-legged intruders who, by daring to transmute things into sound, were unconsciously forging the phenomenon known as History, we can say readily: with indifference. For what did such a newfangled invention matter to a river which flowed on, oozed on, just as before. What did the three Stone Ages, the Beaker folk, the Bronze Age, Iron Age, the Belgic tribes, and all their flints, pots, axes, brooches, and burial customs signify to a river

which possessed as no man did, or does, the secret capacity to move yet remain?

Then the Romans came. What they called the Ouse we do not know either, but we know that they called the Wash “Metaris.” And they were the first to impose their will on the sullen, disdainful Ouse. For they employed several miles of it in the construction of their great catch-water channel, the Car Dyke, which ran, and can still be traced, from the Cam to the Witham—from near Cambridge to near Lincoln—around the whole western flank of the Fens, thus providing yet another example of the Roman skill in engineering and dauntlessness before nature at which modern man still gasps in admiration.

But in those days the Ouse took a different course from that which it takes today. It is a feature of this footloose and obstinate river that it has several times during its brush with human history changed direction, taken shortcuts, long loops, usurped the course of other rivers, been coaxed into new channels and rearranged its meeting place with the sea. All of which might be construed as a victory for history (for it is human ingenuity which in so many cases has effected these changes), yet which is more aptly

Seahorse figurehead from a pleasure boat owned by Louis Philippe, c. 1840.



to be interpreted as the continued contempt of the river for the efforts of men. Since without the old Ouse's perpetual if unhurried unruliness, without its ungovernable desire to flow at its own pace and in its own way, none of those cuts and channels and realignments, which are still being dug, and which ensnare the tortuous, reptilian Ouse in a net of minor waterways, would ever have been necessary.

In Roman times and in that period known as the Dark Ages but which, as many, notably Charles Kingsley, the Fenland fabulist, have opined, was for the Fens their most lustrous and legendary era—the Ouse flowed northward, nearly to March, before meeting with the old River Cam. In that period in which Canute, who could no more stop rivers flowing than he could bid waves retreat, was mesmerized by the singing of the monks as he was rowed past Ely in his royal barge, the Ouse, giving a free ride to its brother Cam, met the sea at Wisbech (which is now ten miles from the coast).

But in the Middle Ages, under license of great floods, the Ouse took it upon itself to flow eastward up one of its own westward-flowing tributaries and by way of this channel to meet the Cam where it still meets it, some dozen miles downstream of Cambridge. At much the same time it abandoned its outfall at Wisbech to the encroachment of silt, and found a new exit at Lynn. Thus the old river became extinct and a new river, a great ragged bow thrown out to the east, was formed, much to the rejoicing of the people of Ely and the tiny community of Gildsey who now found themselves not only on the water route between Lynn and Cambridge but also on that between Lynn and Huntingdon. And much to the disgruntlement of the corn merchants of Huntingdon, whose way to the sea was now extended by many miles.

Then, as we know, Vermuyden came, to put matters right, and dug the Bedford and New Bedford Rivers—straight strings to the bow of the rebellious river—to the glee of the men of Huntingdon who now had better access than ever to the coast, and the dismay of the men of Cambridgeshire whose three-centuries-old

waterway was reduced to little more than a land drain. And thus the fate of that true and natural, if wayward, Ouse (and still called “Great” despite the sapping of its waters along the Bedford Rivers) was to lie thenceforth (for we have now moved into a period which even, historically speaking, is recent and which in the limitless life of a river is but yesterday) in the hands of those local men of ambition so characteristic of this island which as a nation was approaching the peak of its worldwide ambitions.

He knows the water best who has waded through it.

—Danish proverb

The Ouse flows on, unconcerned with ambition, whether local or national. It flows now in more than one channel, its waters diverging, its strength divided, silt prone, flood prone. Yet it flows—oozes—on, as every river must, to the sea. And, as we all know, the sun and the wind suck up the water from the sea and disperse it on the land, perpetually refeeding the rivers. So that while the Ouse flows to the sea, it flows, in reality, like all rivers, only back to itself, to its own source; and that impression that a river moves only one way is an illusion. And it is also an illusion that what you throw (or push) into a river will be carried away, swallowed forever, and never return. Because it will return. And that remark first put about, two and a half thousand years ago, by Heraclitus of Ephesus, that we cannot step twice into the same river, is not to be trusted. Because we are always stepping into the same river.

Graham Swift, from *Waterland*. “What is water, which seeks to make all things level, which has no taste or color of its own, but a liquid form of Nothing?” asks this novel’s narrator, whose ancestors were “water people” turned “plumbers of the land,” constantly pumping to reclaim land from the river. *Waterland* was short-listed for the Booker Prize, which Swift later won in 1996 for *Last Orders*. “One of the attractions of being a writer is that you’re never a specialist,” Swift said in a 2009 interview. “Your field is entirely open; your field is the entire human condition.”

c. 640: Nation of Women

THIRST TRAP

As master and disciples walked along, they came upon a small river of cool, limpid currents. The elder Tang reined in his horse to look around and saw in the distance several thatched huts beneath willows hanging jadelike.

Pointing in that direction, Pilgrim said, "There must be someone running a ferryboat in those houses."

"It's likely," said Tripitaka, "but since I haven't seen a boat, I don't dare open my mouth."

Dropping the luggage, Bajie screamed, "Hey, ferryman! Punt your boat over here."

He yelled several times, and indeed, from beneath the shade of willows, a boat emerged, creaking as it was punted. In a little while, it approached the shore while master and disciples stared at it.

In a moment the boat touched the bank, and the person punting called out, "If you want to cross the river, come over here." Tripitaka urged his horse forward to take a look at the boatman, and a closer look disclosed an old woman.

Walking to the side of the boat, Pilgrim said, "You are the one ferrying the boat?"

"Yes," said the woman.

"Why is the ferryman not here?" asked Pilgrim. "Why is the ferrywoman punting the boat?"

The woman smiled and did not reply; she pulled out the gangplank instead and set it up. Sha Monk then poled the luggage into the boat, followed by the master holding onto Pilgrim. Then they moved the boat sideways so that Bajie could lead the horse to step into it. After the gangplank was put away, the woman punted the boat away from shore and, in a moment, rowed it across the river.

After they reached the western shore, the elder asked Sha Monk to untie one of the wraps and take out a few pennies for the woman. Without disputing the price, the woman tied the boat to a wooden pillar by the water and

walked into one of the village huts nearby, giggling loudly all the time. When Tripitaka saw how clear the water was, he felt thirsty and told Bajie, "Get the alms bowl and fetch some water for me to drink."

"I was just about to drink some myself," said Idiot, who took out the alms bowl and bailed out a full bowl of water to hand over to the master. The master drank less than half of the water, and when Idiot took the bowl back, he drank the rest of it in one gulp before he helped his master to mount the horse once more.

After master and disciples resumed their journey to the West, they had hardly traveled half an hour when the elder began to groan as he rode.

"Stomachache!" he said, and Bajie behind him also said, "I have a stomachache, too."

Sha Monk said, "It must be the cold water you drank."

But before he even finished speaking, the elder cried out, "The pain's awful!"

Bajie also screamed, "The pain's awful!"

As the two of them struggled with this unbearable pain, their bellies began to swell in size steadily. Inside their abdomens, there seemed to be a clot of blood or a lump of flesh, which could be felt clearly by the hand, kicking and jumping wildly about. Tripitaka was in great discomfort when they came upon a small village by the road; two bundles of hay were tied to some branches on a tall tree nearby.

"Master, that's good!" said Pilgrim. "The house over there must be an inn. Let me go over there to beg some hot liquid for you. I'll ask them also whether there is an apothecary around, so that I can get some ointment for your stomachache."

Delighted by what he heard, Tripitaka whipped his white horse and soon arrived at the village. As he dismounted, he saw an old woman sitting on a grass mound outside the village gate and knitting hemp. Pilgrim went forward and bowed to her with palms pressed together saying, "Popo, this poor monk has come from the Great Tang in the Land of the East. My master is the royal brother of the Tang court.



Monsoon over Town, by Mitch Dobrowner, 2017. Archival pigment print, 20 x 30 inches.

Because he drank some water from the river back there after we crossed it, he is having a stomachache.”

Breaking into loud guffaws, the woman said, “You people drank some water from the river?”

“Yes,” replied Pilgrim, “we drank some of the clean river water east of here.”

Giggling loudly, the old woman said, “What a joke! What a joke! Come in, all of you. I’ll explain to you.”

Pilgrim went to take hold of Tang monk while Sha Monk held up Bajie; moaning with every step, the two sick men walked into the thatched hut to take a seat, their stomachs protruding and their faces turning yellow from the pain.

“Popo,” Pilgrim kept saying, “please make some hot liquid for my master. We’ll thank you.”

Instead of boiling water, however, the old woman dashed inside, laughing and yelling, “Come and look, all of you!”

With loud clip-clops, several middle-aged women ran out from within to stare at the Tang monk, grinning stupidly all the time. Enraged, Pilgrim gave a yell and ground his teeth together, so frightening the whole crowd of them that they turned to flee, stumbling all over. Pilgrim darted forward and caught hold of the old woman, crying, “Boil some water quick and I’ll spare you!”

“O Father!” said the old woman, shaking violently, “boiling water is useless, because it won’t cure their stomachaches. Let me go, and I’ll tell you.”

Pilgrim released her, and she said, “This is the Nation of Women of Western Liang. There are only women in our country, and not even a single male can be found here. That’s why we were amused when we saw you. That water your master drank is not the best, for the river is called Child and Mother River. Outside our capital we also have a Male Reception Post House, by the side of which there is also

1904: London

THE OLD MEN ADMIRING THEMSELVES IN THE WATER

I heard the old, old men say,
“Everything alters,
And one by one we drop away.”
They had hands like claws, and their knees
Were twisted like the old thorn-trees
By the waters.
I heard the old, old men say,
“All that’s beautiful drifts away
Like the waters.”

William Butler Yeats, *from In the Seven Woods*.
The Irish poet was in his thirties when he wrote this short verse, though it was not, even then, his earliest work concerned with growing older. “My first denunciation of old age,” he later wrote to Olivia Shakespear, came “before I was twenty.” In 1922, when the Irish Free State was founded, Yeats accepted an invitation to serve in its senate. The following year he was awarded the Nobel Prize in Literature.

a Pregnancy Reflection Stream. Only after reaching her twentieth year would someone from this region dare go and drink that river’s water, for she would feel the pain of conception soon after she took a drink. After three days she would go to the Male Reception Post House and look at her reflection in the stream. If a double reflection appears, it means that she will give birth to a child. Since your master drank some water from the Child and Mother River, he too has become pregnant and will give birth to a child. How could hot water cure him?”

When Tripitaka heard this, he paled with fright.

“O disciple,” he cried, “what shall we do?”

“O father!” groaned Bajie as he twisted to spread his legs further apart, “we are men, and we have to give birth to babies? Where can we find a birth canal? How could the fetus come out?”

With a chuckle Pilgrim said, “According to the ancients, ‘A ripe melon will fall by itself.’ When the time comes, you may have a gaping hole at your armpit, and the baby will crawl out.”

When Bajie heard this, he shook with fright, and that made the pain all the more unbearable.

“Finished! Finished!” he cried. “I’m dead! I’m dead!”

“Second Elder Brother,” said Sha Monk, laughing, “stop writhing! Stop writhing! You may hurt the umbilical cord and end up with some sort of prenatal sickness.”

Our Idiot became more alarmed than ever. Tears welling up in his eyes, he tugged at Pilgrim and said, “Elder Brother, please ask the Popo to see if they have some midwives here who are not too heavy-handed. Let’s find a few right away. The movement inside is becoming more frequent now. It must be labor pain. It’s coming! It’s coming!”

Again Sha Monk said chuckling, “Second Elder Brother, if it’s labor pain, you’d better sit still. I fear you may puncture the water bag.”

“Oh, Popo,” said Tripitaka with a moan, “do you have a physician here? I’ll ask my disciple to go there and ask for a prescription. We’ll take the drug and have an abortion.”

“Even drugs are useless,” said the old woman, “but due south of here there is a Male-Undoing Mountain. In it there is a Child Destruction Cave, and inside the cave there is an Abortion Stream. You must drink a mouthful of water from the stream before the pregnancy can be terminated.”

When Pilgrim heard this, he was filled with delight.

“Popo,” he said, “how far is it from here to the Male-Undoing Mountain?”

“About three thousand miles,” replied the old woman.

“Excellent! Excellent!” said Pilgrim. “Relax, Master! Let old Monkey go and fetch some of that water for you to drink.”

Wu Cheng'en, *from Journey to the West*. *A fan of monster stories in his youth, Wu was classically educated during an era of conservative literary tastes; the rallying cry of leading literary scholars in sixteenth-century China was, “No prose after the Han Dynasty; no poetry after the first period of the Tang Dynasty!” To avoid the disgrace of writing this comic novel—now considered one of the four great classic novels of Chinese literature—Wu published it anonymously.*

c. 240: Pontus

COURSE CORRECTION

A certain river flowed through the region of Pontus whose very name indicated the wildness and savagery of the stream. The locals called it Lycus, the “Wolf,” because it did so much damage. It is large even as it flows down from its sources in Armenia, on account of the mountain heights that furnish it with an abundant flow, and a deep curve which undermines the bases of the cliffs is made much more savage by the torrents of winter as it gathers to itself all

the runoff from the mountains. On the upper plain of the region it traverses, often confined by banks to either side, it overflows its banks in places on either side, flooding with its stream all the adjacent ground, so that it is a continual source of unexpected dangers to the inhabitants of the place, when the river overflows into the fields in the dead of night or even in broad daylight. As a result, not only trees and sown crops and cattle would be destroyed by the rush of the waters but the danger used to touch the inhabitants themselves, shipwrecked in their own houses without warning in the overflow of the water.

Zhang Shun clinging to a rock, by Toyota Hokkei, c. 1835.

One of the 108 outlaw heroes in the novel *Water Margin*, Zhang is nicknamed White Fish for his swimming prowess.



Now when the marvels already accomplished by Saint Gregory had become known to the whole nation, those who lived along that part of the river rose up, and they all in a body, including women and children, became his suppliants, begging to be provided with some deliverance from the desperate evils, on the ground that God was able to accomplish in him all those things that human ingenuity cannot manage. For it was their custom to omit none of those things that belong to human counsel and power, and to plan with rocks and earthen dikes and anything else against such evils, but even after they had done everything, they were unable to withstand the onslaught of the evil. And so that he should be as strongly impelled to mercy as they could make him, they asked him to come see the misfortune in person and learn how it was not possible to move their settlement, and that their death was always waiting in the force of the water.

When he came to the spot, the stream was shown him by his guides, and the sight itself made the problem obvious (for the place had been dug out into a deep gully by the onslaught of the waters), he said to his companions, "It does not belong to men, brothers, to mark off the movement of the water with limits. Only to the Lord of creation is the nature of the elements submissive, staying continuously in whatever places it has been ordained. So since it is God who legislates the limits for the waters, only he by his own power may also constrain the disorder of this river."

He spoke, and having become as if filled by a very divine inspiration, and with a loud voice entreating Christ to come to his assis-

tance for the task before him, he firmly planted his staff that he carried in his hand at the point where the bank was breached.

The ground there, which was very moist and spongy, gave way at once to the weight of the staff and the hand of the one planting it, so that it sank easily all the way down. Then having entreated God that this should become a kind of bar and hindrance to the disorderliness of the river, he returned again, having shown by deed that all that he did was accomplished by divine power. For immediately, not after a long time, the staff took root in the bank and became a tree; this tree furnished a boundary to the stream, and even today the tree is a visible sign and reminder to those who live nearby. Whenever heavy rains and winter storms make that Lycus rise as usual and begin to rage, frothing passionately in its flow, then, when around the trunk of the tree it attains its highest point of flood, it again piles higher in the middle and reduces its flow, and as if fearing to approach the tree it passes the area by with arched crest. Right up to the present the tree is called the Staff, a memorial of Gregory's grace and power preserved for the local people for all time.

Gregory of Nyssa, from the *Life of Saint Gregory the Wonder-Worker*. Born into a prominent Cappadocian Christian family around 330, Gregory of Nyssa was named after—and became the biographer of—the third-century saint Gregory the Wonder-Worker. Educated in classical philosophy as well as in scripture, he became known for his skill in communicating dogma through vivid metaphors when serving as bishop of Nyssa: "Of what benefit to the thirsty is a magnificent aqueduct," he wrote, urging clergymen to focus on matters of the soul, "if there is no water in it?"

Regatta, by Joe Carr, 2015.



1974: Tinker Creek

STREAM OF CONSCIOUSNESS

A wind rose, quickening; it seemed at the same instant to invade my nostrils and vibrate my gut. I stirred and lifted my head. No, I've gone through this a million times, beauty is not a hoax—how many days have I learned not to stare at the back of my hand when I could look out at the creek? Come on, I say to the creek, surprise me; and it does, with each new drop. Beauty is real. I would never deny it; the appalling thing is that I forget it. Waste and extravagance go together up and down the banks, all along the intricate fringe of spirit's free incursions into time. On either side of me, the creek snared and kept the sky's distant lights, shaped them into shifting substance and bore them speckled down.

This Tinker Creek! It was low today, and clear. On the still side of the island, the water held pellucid as a pane, a gloss on runes of sandstone, shale, and snail-inscribed clay silt; on the faster side, it hosted a blinding profusion of curved and pitched surfaces, flecks of shadow and tatters of sky. These are the waters of beauty and mystery, issuing from a gap in the granite world; they fill the lodes in my cells with a light like petaled water, and they churn in my lungs mighty and frigid, like a big ship's screw. And these are also the waters of separation: they purify, acrid and laving, and they cut me off. I am spattered with a sop of ashes, burnt bone knobs, and blood; I range wild-eyed, flying over fields and plundering the woods, no longer quite fit for company.

Bear with me one last time. In the old Hebrew ordinance for the waters of separation, the priest must find a red heifer, a red heifer unblemished, which has never known the yoke, and lead her outside the people's camp, and sacrifice her, burn her wholly, without looking away: "burn the heifer in his sight; her skin, and her flesh, and her blood, with her dung, shall he burn." Into the stinking flame the priest casts the wood of a cedar tree for longevity, hyssop



Vase with knopped stem,
attributed to Harry Powell, c. 1880.

for purgation, and a scarlet thread for a vein of living blood. It is from these innocent ashes that the waters of separation are made, anew each time, by steeping them in a vessel with fresh running water. This special water purifies. A man—any man—dips a sprig of hyssop into the vessel and sprinkles—merely sprinkles!—the water upon the unclean, "upon him that touched a bone, or one slain, or one dead." So. But I never signed up for this role. The bone touched me.

Annie Dillard, from *Pilgrim at Tinker Creek*. "Classifying Annie Dillard as a 'nature writer' does her a disservice," scholar Don Scheese has written. "Investigating the nonhuman world is for Dillard a religious experience, a way to communicate with God." Dillard, who won the Pulitzer Prize in Non-fiction in 1975 for *Pilgrim at Tinker Creek*, also doesn't consider herself a nature writer. "I'm no scientist," she said, "but a poet and a walker with a background in theology and a penchant for quirky facts."

2010: Antarctica

ON THIN ICE

The Antarctic ice blanket is on average about a mile and a half thick—at its thickest it is more than two and a half miles, about twelve Empire State Buildings stacked atop one another. And even though the surface temperature averages about -50 to -60 degrees Fahrenheit over the year, at the base of this ice pile, the temperature is warm enough to melt the ice. The heat comes from deeper within Earth, and although it is only a trickle of heat compared to what the Sun supplies, over time it has been enough to melt the base of the ice. Where does that meltwater go? Effectively, nowhere—it fills in low-lying topography in the rock surface to form what are called subglacial lakes.

Two and a half miles beneath the Russian Vostok scientific station sits the largest subglacial lake in Antarctica—Lake Vostok, about the size of Lake Ontario, and on average about a thousand feet deep. The ice beneath Vostok Station has been drilled and cored to a depth just a hundred or so feet above the lake surface, and at that depth the ice is about 450,000 years old. That means that if there is any life in the lake, it has been isolated from life elsewhere on Earth for nearly a half million years. Just as Australia, because of its long isolation as an island, has many animals unique to the territory—the kangaroo, the koala bear, the platypus—so might Lake Vostok show some microbial evolutionary products that reflect its long isolation.

H₂O on Earth is continually moving from one reservoir to another. Water evaporates from the oceans, and some of it falls as rain or snow on the continents. Some of the precipitation infiltrates the ground and moves slowly through the subsurface reservoir. Some flows overland in rivers, returning to the sea only a month or two after precipitation. Most snowfall lasts only a season on land before rejoining the ocean reservoir. But the snow that falls on the Antarctic ice cap, and is later compressed

into a layer of ice, may remain on the great white continent for hundreds of thousands of years before it creeps back to the sea in one or another of the many glaciers that drain ice from Antarctica.

Over short intervals of time, there is an equilibrium between the relative sizes of the reservoirs, but over long periods of time, large transfers between the two biggest reservoirs, the oceans and ice, occur. When water leaves the oceans to become a temporary icy resident on the continents, the sea level falls, the continental shelves are exposed, and the continents experience an ice age. The spread of ice over the land surface overrides the grasses, plants, and trees, and eliminates the vegetable component of diet for a wide variety of omnivores and herbivores. When the climate ameliorates and ice sheets melt, the water returns to the oceans, the sea level rises, and the newly exposed land surface is reoccupied biologically. These temporary loans of ocean water to the continents in the form of ice have taken place some twenty times during the past three million years of Earth's history alone, and several other times in the more distant past.

The fact that ice ages come and go tells us that ice on Earth is always on the cusp of existence—a push one way, and ice grows and spreads; a push the other way, and ice retreats and disappears. There is also a temporal component to the cusp with present-day relevance—on one side of the cusp are the ice ages of the recent past; and on the other side, the ascendancy of Earth's human population as a major player in the global climate system, a force that is pushing ice toward disappearance.

Henry Pollack, from *A World Without Ice*. *A professor of geophysics at the University of Michigan since 1964, Pollack was, with former vice president Al Gore, awarded the 2007 Nobel Peace Prize for his participation in the Intergovernmental Panel on Climate Change. He travels annually to Antarctica. "Ice asks no questions, presents no arguments, reads no newspapers, listens to no debates," he writes elsewhere in this book. "It is not burdened by ideology and carries no political baggage as it crosses the threshold from solid to liquid. It just melts."*

1951: Qabab

WILFRED THESIGER BETWEEN GOLDEN REEDS

In the morning, my host, Sheikh Majid's son Fali, sent me to Qabab in a canoe paddled by three men. "They will take you to Sadam, my father's representative in Qabab. Come back whenever you are tired of living among the Madan marsh dwellers. Go in peace."

We started off down the main river and passed a large *mudhif* (guesthouse). Below it a small village straggled along the riverbank, a drift of gray smoke showing above the line of houses. Buffalo, black, sullen-looking brutes,

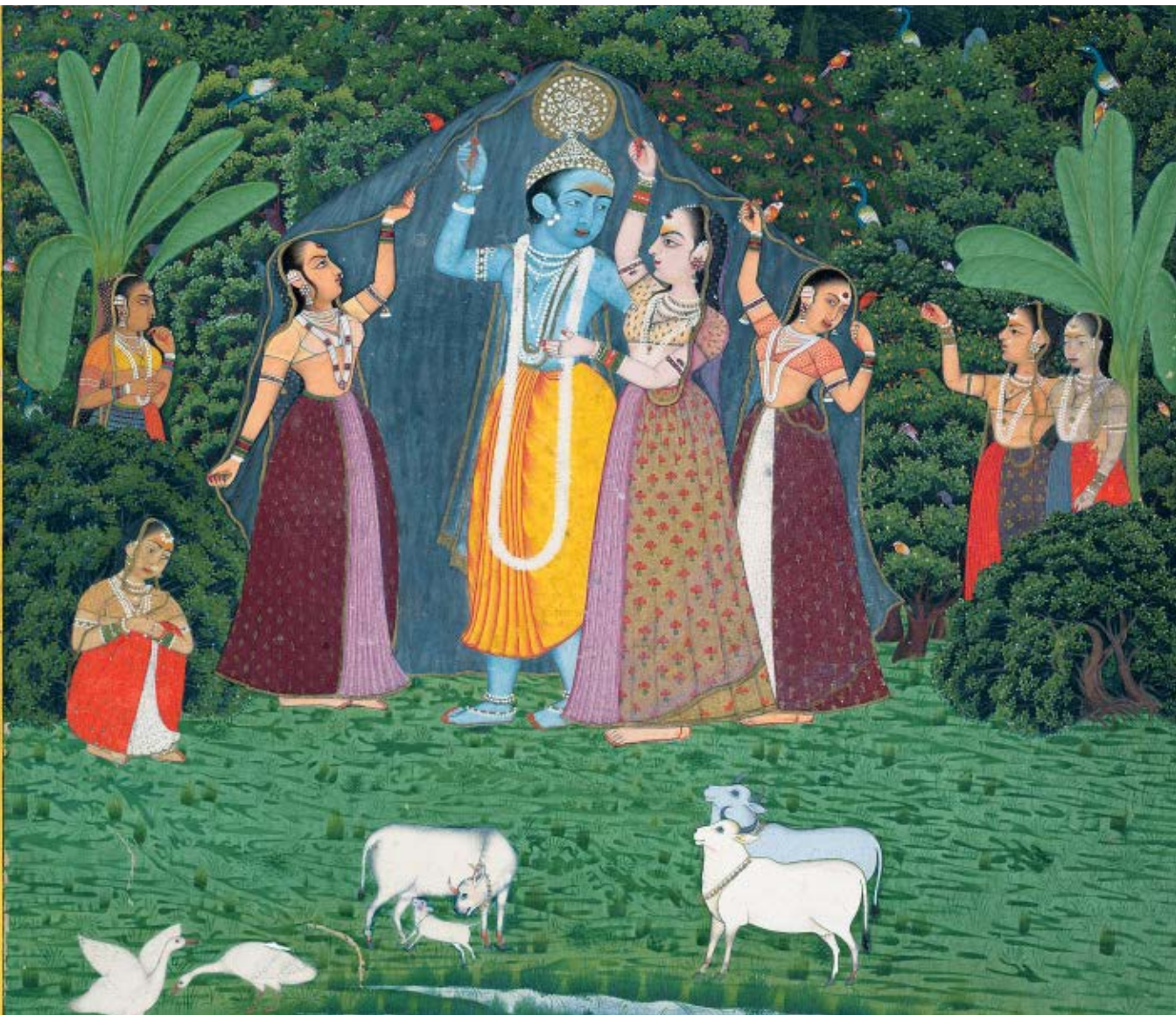
heavy bodied and shaggy coated, stood beside the river or rested in the water with only their noses, the tops of their heads, and their thick, curved horns showing. Canoes of various sizes were moored along the bank, and drawn up on dry land were the rotten remains of others, the planks fallen from their ribs. The usual collection of pye-dogs chased us, barking from the water's edge. A man watched silently from the entrance of a house. "Go on, Sahib, greet him," said one of the canoemen.

I called out, "*Salam alaikum*." He answered, "*Alaikum as salam*," and added, "Stop and eat."

I replied, "We have fed, God protect you."

"Good," said the man behind me, "you must learn our ways. You see it is the custom

Krishna and the Gopis Take Shelter from the Rain, India, 1760.



for the man in the boat to greet the man on the shore, and for the boat going downstream to greet the boat coming up.”

Below the village, willow trees, bare as yet, except for a touch of green bursting from their buds, lined the bank on either side; their lower branches trailed in the muddy water, dipping to the current. Behind them were jungles of untended palms and in one place reed houses in a clearing. Here the river forked once more, and we took the smaller right-hand branch. Fields of wheat and barley, another village, mudflats, and then the marshes’ edge and beds of bulrushes.

We followed a narrow twisting channel through the reeds, and for the first mile passed many canoes returning, so deeply loaded with soaking piles of *qasab* shoots—a giant grass, which looked like bamboo—that little was visible of the canoes themselves. They were paddled by half-naked men and boys, sometimes two in a canoe but more often one. “*Hashbish* (fodder) for their buffalo,” said the man who had appointed himself as my instructor. He was called Jahaish (little donkey). This was not a nickname but his proper name. Many of these tribesmen had wildly improbable names; Jahaish was one of the least odd. I was to meet at

Rooms with a View

Waterfront communities



Floating Islands, Lake Titicaca

This village of seventy islands constructed by the Uru people from local *totora* reed has floated in Lake Titicaca for centuries, predating the Incan Empire. The bottoms of the islands disintegrate in the lake; fresh *totora* is continually added from above.



Ha Long Bay, Vietnam

A government program aimed at improving access to education and stemming pollution has resettled more than half of the 2,100 residents of the floating villages in Ha Long Bay. Many former fishermen now make their living ferrying tourist boats.



Ko Panyi, Thailand

This fishing village in Ao Phang Nga National Park, consisting of stilt houses built at the base of one of the bay’s towering limestone karst islands, was founded by Muslims in the late eighteenth century. The construction of a floating soccer field has helped to draw tourists.



Kampong Ayer, Brunei

Consisting of forty-two stilt-house villages connected by a twenty-three-mile-long boardwalk built in the Brunei River over six hundred years ago, Kampong Ayer is home to 13,000 people—3 percent of Brunei’s population—making it the world’s largest community situated over water.

Ganvié, Benin

Sitting in the middle of Lake Nokoué, Ganvié was founded around 1600 as a refuge from slavers whose religious beliefs forbade them from attacking anyone on water. Twenty thousand people currently live in the village’s stilt houses.



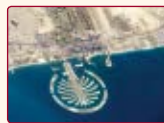
Giethoorn, Netherlands

This waterlogged village dates to the thirteenth century, with residential houses built on islands and surrounded by canals. The preferred method of transportation is by motorized “whisper boat”; in winter the canals are occasionally navigable by ice skate.



Palm Jumeirah, United Arab Emirates

An artificial archipelago in the shape of a palm tree off the coast of Dubai, Palm Jumeirah was built using sand dredged from the Persian Gulf, altering surrounding wave patterns and sea temperatures since construction started in 2001. Rows of palatial villas line each “frond.”



The World

The first entirely residential cruise ship, *The World* has 165 luxury apartments that sold for between \$2 million and \$15 million when it launched in 2002. Amenities include the ocean’s only full-size tennis court and a 12,000-bottle wine collection.



various times men or boys called Chilaib (little dog), Bakur (sow), and Khanzir (pig), startling among Muslims, who regarded both dogs and pigs as unclean. Others had such strange names as Jaraizi (little rat), Wawai (jackal), Dhauba (hyena), Kausaj (shark), Afrit (Jinn), and even Barur (dung). In order to avert the evil eye, unattractive names like these were often given to boys whose brothers had died in infancy.

We passed a place where they were gathering hashish, the Arabic word for grass applied here to young reeds used for fodder. A naked boy stood in the bows of a canoe cutting the green shoots with a saw-edged sickle, and piling them, dripping wet, into the canoe behind him. Every now and again he drew his canoe forward a yard or two by pulling on the bigger stems. Beyond the curtain of the reeds, I could hear voices and laughter. A boy's voice, very clear and true, sang a lilting song; my canoe-men stopped to listen. "That is Hasan," one of them said appreciatively. The song ended and someone called out, "Give us another."

It was a scene which was to become familiar during the next seven years. Sometimes the setting was winter, the water icy cold with a chill wind sweeping across the marshes from the Kurdish snows. Sometimes it was summer, the air saturated with moisture; then it was unbearably hot in the tunnels at the bottom of the dark, towering reeds, and mosquitoes danced in hovering clouds. It seldom seemed to be spring or autumn, for those are brief periods in this part of the world. But whether it was winter or summer, I associate the sounds of laughter and song with the reed beds, where the marshmen toiled gathering fodder for their insatiable buffalo.

We passed no more canoes and moved slowly, almost drifting, down the still lanes between the golden reeds. Except when one of us spoke, there was hardly a sound other than the subdued splash of the paddles and the whisper of water under the prow. Gradually the lane broadened, and we found ourselves at the edge of a small lake, three-quarters of a mile wide. The water was a vivid blue in the sunlight. Jahaish said, "We will go straight across; there is

1988: Buergete

SLOW DISSOLVE

The small hotel of Buergete is made of water. Outside, rain streams all night. Roofs pour, the gutters float with frogs and snails. You would not see me—I lie in the dark listening, swirling. Walls of the hotel are filled with water. Plumbing booms and sluices. A water clock, embedded in the heart of the building, measures out our hours in huge drops. Wheels and gears turn in the walls, the roaring of lovers washes over the ceiling, the staircase is an aqueduct of cries. From below I can hear a man dreaming. A deep ravine goes down to the sea, he calls out, rushes over the edge. The mechanisms that keep us from drowning are so fragile: and why us?

In the morning the hotel is dark, no sign of life, no smell of coffee. Old clock ticking in the deserted hall. Dining room empty, shutters drawn, napkins in glasses. Morning drifts on. I peer into the kitchen: still as a church. Everyone has been washed away in the night. We pile money on the table in the hall, leave without breakfast, without ado! as they say in my country. Outside is silent, street dissolving, far hills running down in streaks. We filter westward.

Anne Carson, from "The Anthropology of Water." *The author is notoriously protective about details of her own life; a profile of Carson once noted that "her back-flap biography—Anne Carson was born in Canada and teaches ancient Greek for a living"—is so minimalist that it sounds like a parody of a back-flap biography.* This lyric essay, part of her Plainwater collection of poetry and prose, was inspired by a 380-mile walk across Spain, which she completed in a decade-old pair of Saucony running shoes.

no wind." A large band of coots rested on the lake and beyond them a lot of ducks, too far off to identify. I picked up my gun, but the ducks rose as we emerged from the shelter of the reeds.

"They are very wild now," Jahaish said. "You should come here in the autumn when they have just arrived. Then you could shoot as many as you wish. Falih got a lot this winter."

The reeds across the lake looked like low sandstone cliffs along a much indented coast, while those in the distance behind reminded me of fields of ripe corn. On the far side, we plunged

again into the reedbeds and met two large boats. They were stacked with dry reeds and left us only just space to pass. Both were very roomy, with high sides, about thirty feet long, and with a decoratively carved stern and prow. Each carried a crew of three, who propelled the boat slowly forward by setting their poles in the water and then moving step by step along the gunwale, from bow to stern. Having reached the stern, they walked back and started again.

“Is Saddam at Qabab?” shouted Jahaish.

“Yes, he got back the day before yesterday from Khalaf’s.” Khalaf was Falih’s younger brother. “Where are you going?”

“To Saddam. We are taking the Englishman there from Falih’s.”

“Where is Falih?”

“At home.”

“And Majid?”

“Still in Baghdad.”

“We call these boats *balam*,” Jahaish told me. “They come from Qabab with reeds for Majid’s new mudhif.”

The history of the land has been written very largely in water.

—John Hodgdon Bradley Jr., 1935

Soon afterward we overtook canoes loaded with hashish, on their way back to Qabab. The channel was evidently shallower, for bulrushes grew among the qasab. It broadened out; we rounded a promontory of rushes and there, on a shining expanse just rippled by the breeze, was the village; the houses were reflected in the water. A haze of white smoke merged into the pale-blue sky above them, and a wall of yellow rushes lay beyond. There were sixty-seven houses scattered about the lagoon, sometimes only a few yards apart. From a distance they appeared to be actually in the water, but in fact each was constructed on a soggy pile of rushes, resembling a giant swan’s nest, just large enough for the building and a space in front. Two buffalo stood before the nearest, water dripping from their black coats; others lay more or less submerged nearby. Like

those on the mainland, the houses were all made of mats, fastened over an arched framework of qasab. They were open at one end, and we could look into them as we paddled past. Some were of a fair size; others were mere shelters hardly to be classed as houses at all. The newer ones were the color of fresh straw, but most were dirty gray.

Everywhere people climbed in and out of canoes, to get from one small artificial island to another. Men and boys were carrying armfuls of hashish ashore, to pile it in front of their houses. We called a greeting to them and they answered, “Welcome, welcome. Stop and eat.” I watched a boy of four or five step into a canoe, pick up a pole, push off, and punt toward a reedbed. A young woman with a child in her arms called to him as he passed. She had a lovely face, tapering to a delicate chin, and wore a black dress, with a coarse black cloak thrown over her head. In front of another house, two girls in long gowns of patterned cloth, one red, the other green, pounded grain in a wooden mortar with long heavy pestles. They struck in turn, bending their bodies forward from the hips, and grunted rhythmically with each blow.

Sadam’s mudhif was at the far end of the village on the edge of the reedbeds and a little apart from the other houses. The largest building in Qabab, it was the only one on dry ground, for it occupied a small sheer-sided island of black earth that rose five or six feet above the surrounding water. This island was evidently an ancient site, for brickwork showed near the water level. As we approached, Saddam came out, shouting over his shoulder to a boy to hurry up and bring carpets. “Welcome, welcome,” he called, and helped me ashore.

From The Marsh Arabs. After serving in the British Special Air Service during World War II, Thesiger traveled in Africa and the Middle East, spending time among the inhabitants of the wetlands created by the Tigris and Euphrates rivers. “Soon the marshes will probably be drained,” Thesiger wrote in 1964. “When this happens, a way of life that has lasted for thousands of years will disappear.” Thirty years later, two-thirds of the marshes had been destroyed, and most marsh dwellers had either been killed or driven into exile.



Ebb, by David Hilliard, 2012. Archival pigment print, three panels.

1791: Niagara Peninsula

BEFORE THE FALL

I stayed two days in the Indian village, where women busied themselves with various tasks, while their infants slept suspended in large wicker nets hung from the arms of a purple beech. The grass was covered with dew, the wind carried with it the scent of the woods, and the native cotton plants, spilling over with white capsules, looked like white rosebushes. The breeze rocked the children's aerial cradles almost imperceptibly. From time to time, the mothers glanced over their shoulders to see whether their children were still asleep, or whether they had been woken by the birds. From this Indian village to the falls, it was about three or four leagues. It would take as many hours for my guide and me to reach them. Six miles away a column of mist already showed me the place where the waters tumbled low. My heart pounded with a joy mixed with terror as I entered those woods that hid from view one of the greatest spectacles nature has offered mankind.

We dismounted. Leading our horses by the bridle, we traveled across glades and thickets to the bank of the Niagara River, seven or eight hundred paces above the falls. I was walking relentlessly forward when my guide seized me by the arm; he stopped me at the very edge of the

water, which flowed past at the speed of an arrow. It did not foam at all but glided in a single mass over the rocky slope. Its silence before the falls contrasted wildly with the roar of the falls themselves. Scripture often compares a people to great waters; here, it was a dying people, who, deprived of their voice by long struggle, were now hurling themselves into the abyss of eternity.

The guide still held onto me, for I felt myself drawn, so to speak, by the river: I had an involuntary desire to throw myself in. I cast my eyes first upstream, to the riverbanks, then downstream, to the island that divided the waters and where these waters suddenly ceased to be, as if they had been cleft in the sky.

After a quarter of an hour of perplexity and inexpressible admiration, I made my way to the falls.

I could not convey the thoughts that stirred in me at the sight of such a sublime disorder. In the desert of my early life, I had to invent people to decorate the wastes around me; I drew on my own substance to make beings that I did not find elsewhere, and I carried these beings within me. For what is a cascade that falls eternally before the insensible face of the earth and the sky if human nature is not there with its motives and its misery? How joyless to be submerged in that solitude of waters and mountains and then not know whom to tell about this great spectacle! To have the waves, the rocks, the woods, and

the mountain streams to oneself alone! Give the soul a companion, and the smiling verdure of the hills, and the cool breath of the mist, will enapture it. The day's journey, the sweet repose at its end, the rocking of the waves, the soft slumber on the moss—these things will draw the deepest tenderness from the human heart. Alexander created cities wherever he roamed; I have left dreams wherever I have dragged my weary days.

I have seen the cascades of the Alps with their chamois and those of the Pyrenees with their izard; I have not gone far enough up the Nile to see its cataracts, which are no more than rapids; and I will not speak of the azure zones of Terni and Tivoli, those elegant lines of ruins fit for the poet's song: "And the swift Anio and the sacred grove of Tibur."

Far water cannot quench near fire.

—*Japanese proverb*

Niagara eclipses them all. I contemplated this waterfall that was revealed to the Old World, not by lowly little travelers like myself but by missionaries who, searching for God in these solitudes, threw themselves on their knees at the sight of nature's marvels and were martyred while they sang their hymns of praise. Our priests hailed the beautiful sites of America and consecrated them with their blood; our soldiers clapped their hands at the ruins of Thebes and presented arms in Andalusia: the whole genius of France lies in the double militia of our camps and our altars.

I was holding my horse's bridle twisted around my arm when a rattlesnake rustled in the undergrowth. My startled horse reared and recoiled toward the falls. I could not seem to untangle my arm from the reins. The horse, growing more and more frightened, dragged me after him. Already his forefeet were off the ground; poised over the brink of the abyss, he kept himself from falling only by the strength of his loins. It was all over for me when suddenly the animal, astonished by this new danger, pirouetted back to dry ground. If I had left

this life in the Canadian woods, would my soul have brought to the supreme tribunal any sacrifices, or any good works, or any virtues? Or would I have died with nothing to show but empty days and miserable illusions?

This was not the only risk I ran at Niagara. To get to the lower basin of the falls, the savages used a ladder of vines, which was at that time broken. Desirous to see the height of the cataract from below, and despite my guide's protestations, I ventured down the side of an almost perpendicular rock. Ignoring the roar of the water that frothed below me, I kept my head and succeeded in getting about forty feet from the bottom. At that point the bare and vertical stone offered nothing more for me to grip. So I remained, hanging by one hand from the last available root and feeling my fingers gradually giving way beneath the weight of my body; there are few men who have counted two minutes of their lives as I counted those. At last my exhausted hand let go, and I fell. By an incredible stroke of good fortune, I found myself on a ledge of rock, upon which I should have been broken a thousand times, and I did not even feel great pain. I was half a foot from the abyss, but somehow I had not rolled into it. When the cold and the damp began to work upon me, however, I discerned that I had not gotten away so cheaply after all: I had broken my left arm above the elbow. The guide, who was looking down at me from above and to whom I was making signals of distress, ran off to find the savages. They hoisted me up on a rope along an otter path and carried me to their village. It was only a simple fracture. Two splints, a bandage, and a sling sufficed for my cure.

François-René de Chateaubriand, *from Mémoires from Beyond the Grave. Fearful of the French Revolution—"the more conscientious and moderate your opinions," he wrote, "the more suspect and prone to attack"—the aristocratic Chateaubriand left France for five months in 1791, arriving in Baltimore in July, then making his way north by stagecoach, boat, and horse. It is believed that the trip to Niagara did occur as recorded in his posthumously published Mémoires, though further journeys he claimed to have taken through America were at least partially fabricated.*

2018: Cape Town

DAY ZERO

A row of cars, wheels half-hanging from the pavement, has become a fixture on this once quiet, tree-lined road. The chain of vehicles stretches up the hill, as bodies shuffle from the water point, loaded with however much water can be carried. The containers vary as much as their carriers: battered old bottles, handleless buckets that have seen better days, and expensive jerrycans ready and waiting for end-of-days scenarios. It certainly feels like it; eruptions of anger at the public water spring are increasingly common, water in five-liter bottles are sold out at most stores, while neighbors monitor one another to see whose grass remains stubbornly green, in this once-in-a-century drought.

Cape Town. The hometown to which I returned late last year might soon become the world's first major city to run out of water, or this is the language being employed to describe this potentially catastrophic event that is a probable consequence of global climate change. At some point, early in April (the city has now

adjusted that date to mid-May), the dams will likely dip beneath usable levels of 13.5 percent, and so piped water, glorious modern invention as well as a fundamental human right, will fall out of easy reach. Right now all residents are restricted to fifty liters of water per day in an effort to thwart the moment when taps run dry entirely, and it's the reason that a procession of people play their part in this sudden dystopia, all day and night, so they can build their rations of free available water while they can. (The water from the Newlands public spring streams down the mountain and would ordinarily flow toward the sea were it not for the constant presence of bottles, buckets, and jerrycans these days.)

More astounding than the sight of people queuing to collect water is the location of this frenzied water gathering: Newlands. In parts of the city—certain black and colored neighborhoods with informal housing—this remains a norm, with one water point servicing multiple families that have neither piped water nor access to electricity.

But this is Newlands, a lush and prosperous suburb given its high rainfall and proximity

God Separating the Waters, engraving by Francesco Villamena, after Raphael, 1626.





Meghan, Saw Kill River, Annandale, NY, by Katy Grannan, 2002.

to the mountain—the eastern slopes of Table Mountain in walking distance. The grid of roads surrounding the spring is filled with contemporary conversions of old row or stand-alone houses. Ancient oaks abound. At the corner is the area’s hub of cosmopolitan eateries serving Parisian pastries, aged steaks, designer coffee concoctions, and very fine wine. The restaurants are always packed. How noticeable that the patrons are not the people who come in their droves to the spring to collect water. The patrons are almost always white, while the water collectors largely come from afar and are mostly colored, sometimes black (these apartheid classifications continue to largely reflect demographics of suburb and income). The jolt of their sudden presence is visible in the many disagreements about where they may or may not park or during tense negotiations as expensive German sedans or 4x4s creep past

rusty old Fords, hatchbacks, and pickup trucks. Tempers rise. Tensions mount.

There is a crossing of worlds here—more—a disruption. I should know now that I am a resident of Newlands and part of this enclave. Up to a point at least. Like the water collectors, perhaps I, too, might be considered an interloper—a blackish Capetonian who has some ability to choose where to live in the city of my birth.

And yet the matter of who is and who is not interloping, peaked during a standoff one morning outside the spring, before it had even turned eight AM. A towering white man leaped out of his expensive sports car to shout at a couple blocking traffic close to the water point. In turn a small colored woman propelled herself out of her *bakkie*, and heated words were exchanged.

“Go back to where you come from,” shouted the man.

“Go to hell. *This* is where I’m from. Newlands is exactly where I grew up.”

“You’re stupid,” he shouted before climbing into his car and speeding away.

Like so many other places, most notably District Six, Newlands—like many of the now predominantly white suburbs on this side of the mountain, from the city center to Simon’s Town—is rooted in the history of the city and country with its forced removals. Black and colored families were expelled from Newlands after apartheid was legislated in 1948 (via the 1950 Group Areas Act) and draconian laws were enforced to evict families from their homes, dispersing them in townships, peripheral to the city’s economic and cultural activity.

While many parts of Cape Town remain greatly segregated today, Newlands strikes me as one of the worst offenders and is still stubbornly shut to the idea of postapartheid restitution and any significant inclusion. Anthropologist Catherine Besteman claims in her book *Transforming Cape Town* that residents of Newlands repeatedly stymied efforts at such restitution by insisting that “its history as a rural estate and the special character of the neighborhood must be respected.”

Today homes, places of business, and schools in Newlands rarely reflect the city’s mixed race and black heritage or that of the suburb. The St. Andrew’s Church in the area erected a small wooden cross in 1994, commemorating the exodus of the majority of their congregation with the forced removals. But there is little else in Newlands to acknowledge or heal the past.

The matter of why so few area locals line up for water says something else about the situation and what it means for the most vulnerable. Many of those who can afford to had months ago planted pricey plastic water tanks in their backyards to collect rainwater. Several have pools on standby, filled with chlorinated water—good enough for flushing at least—or they have had the financial wherewithal to stockpile five-liter water bottles for some time. It is the majority of the city, its poor, that will be

left to the care of authorities who have proved themselves riven, and intransigent in allowing the situation to become quite so perilous. As always, the poor are inevitably people of color: black and colored families who remain in the shadow of apartheid’s economic and spatial legacy. For us all, the city has promised some two hundred water points where water will have to be collected and carried home should the dreaded day of zero water arrive. The logistics seem iffy.

*I came upon no wine,
So wonderful as thirst.*

—Edna St. Vincent Millay, 1923

I pass by the public water spring two or three times each day as I drop and collect my children from school and to see what, if anything, has changed. There are always people there. More these days, including wealthier residents and their black porters, or entrepreneurs plucked from the city’s homeless, who have made a business of appropriating retailer’s trolleys and with these deliver several bottles of water to cars for a small fee. I hear the city authorities are planning to divert the water spring to someplace less likely to create such disruption and inconvenience, which is an unsurprising pity, for the disturbance has been the most honest and defining moment the place has seen in decades. Historic amnesia defied.

For now the spring is constantly patrolled. Cars and bakkies still arrive, their hapless owners ready to collect as much water as they can carry before the city runs dry completely.

C.A. Davids, “*The Water Point*.” In March 2018 Cape Town officials announced that the city’s drastic water-use restrictions had lessened the likelihood of Day Zero, but continually uncertain rainfall levels mean the threat remains for 2019. Davids published her debut novel, *The Blacks of Cape Town*, in 2013. In an interview later that year, she described how she “grew up reading the colonial canon: Jane Austen, Charles Dickens, Shakespeare,” but “it wasn’t until I read Salman Rushdie that it seemed like a literary lobotomy had been performed on me.”



DELUGE

2140: New York City

KIM STANLEY ROBINSON PRESENTS THE COMING ATTRACTION

The First Pulse was not ignored by an entire generation of ounce brains, that is a myth. Although like most myths, it has some truth to it which has since been exaggerated. The truth is that the First Pulse was a profound shock, as how could it not be, raising sea level by ten feet in ten years. That was already enough to disrupt coastlines everywhere, also to grossly inconvenience all the major shipping ports around the world, and shipping is trade: those containers in their millions had been circulating by way of diesel-burning ships and trucks, moving around all the stuff people wanted, produced on one continent and consumed on another, following the highest rate of return, which is the only rule that people observed at that time. So that very disregard for the consequences of their carbon burn had unleashed the ice that caused the rise of sea level that wrecked the global distribution system and caused a depression that was even more damaging to the

people of that generation than the accompanying refugee crisis, which, using the unit popular at the time, was rated as fifty katrinas. Pretty bad, but the profound interruption of world trade was even worse, as far as business was concerned. So yes, the First Pulse was a first-order catastrophe, and it got people's attention and changes were made, sure. People stopped burning carbon much faster than they thought they could before the First Pulse. They closed that barn door the very second the horses had gotten out. The four horses, to be exact.

Too late, of course. The global warming initiated before the First Pulse was baked in by then and could not be stopped by anything the postpulse people could do. So despite "changing everything" and decarbonizing as fast as they should have fifty years earlier, they were still cooked like bugs on a griddle. Even tossing a few billion tons of sulfur dioxide in the atmosphere to mimic a volcanic eruption and thus deflect a

1848: London

CESSPOOL

Filthy river, filthy river,
Foul from London to the Nore,
What art thou but one vast gutter,
One tremendous common shore?

All beside thy sludgy waters,
All beside thy reeking ooze,
Christian folks inhale mephitis,
Which thy bubbly bosom brews.

All her foul abominations
Into thee the city throws;
These pollutions, ever churning,
To and fro thy current flows.

And from thee is brew'd our porter—
Thee, thou gully, puddle, sink!
Thou, vile cesspool, art the liquor
Whence is made the beer we drink!

Thou, too, hast a conservator,
He who fills the civic chair;
Well does he conserve thee, truly,
Does he not, my good Lord Mayor?

"Dirty Father Thames." Punch, the satirical weekly magazine where this poem first appeared, often commented on the sanitation of Victorian London. Ten years after this poem's publication, record-high summer temperatures contributed to the Great Stink of 1858. Unable to hold sessions due to the smell wafting into Westminster, Parliament considered moving its chambers farther from the shores of the Thames but ultimately passed a bill commissioning a modern sewage system for the city.

fair bit of sunlight, depressing temperatures for a decade or two, which they did in the 2060s to great fanfare and/or gnashing of teeth, was not enough to halt the warming, because the relevant heat was already deep in the oceans, and it wasn't going anywhere anytime soon, no matter how people played with the global thermostat, imagining they had godlike powers. They didn't.

It was that ocean heat that caused the First Pulse to pulse, and later brought on the second one. People sometimes say no one saw it coming, but no, wrong: they did. Paleoclimatologists looked at the modern situation and saw CO₂ levels screaming up from 280 to 450 parts per million in less than three hundred years,

faster than had ever happened in the Earth's entire previous five billion years (can we say "Anthropocene," class?), and they searched the geological record for the best analogues to this unprecedented event, and they said, Whoa. They said, Holy shit. People! they said. Sea level rise! During the Eemian period, they said, which we've been looking at, the world saw a temperature rise only half as big as the one we've just created, and rapid dramatic sea-level rise followed immediately. They put it in bumper sticker terms: massive sea-level rise sure to follow our unprecedented release of CO₂! They published their papers, and shouted and waved their arms, and a few canny and deeply thoughtful sci-fi writers wrote up lurid accounts of such an eventuality, and the rest of civilization went on torching the planet like a Burning Man pyromasterpiece. Really. That's how much those knuckleheads cared about their grandchildren, and that's how much they believed their scientists, even though every time they felt a slight cold coming on, they ran to the nearest scientist (i.e., doctor) to seek aid.

But okay, you can't really imagine a catastrophe will hit you until it does. People just don't have that kind of mental capacity. If you did, you would be stricken paralytic with fear at all times, because there are some guaranteed catastrophes bearing down on you that you aren't going to be able to avoid (i.e., death), so evolution has kindly given you a strategically located mental blind spot, an inability to imagine future disasters in any way you can really believe, so that you can continue to function, as pointless as that may be. It is an aporia, as the Greeks and intellectuals among us would say, a "not-seeing." So, nice. Useful. Except when disastrously bad.

So the people of the 2060s staggered on through the great depression that followed the First Pulse, and of course there was a crowd in that generation, a certain particular one percent of the population, that just by chance rode things out rather well, and considered that it was really an act of creative destruction, as was everything bad that didn't touch them, and all people needed to do to deal with it was to buckle down in their

traces and accept the idea of austerity, meaning more poverty for the poor, and accept a police state with lots of free speech and freaky lifestyles velvet gloving the iron fist, and hey, presto! On we go with the show! Humans are so tough!

But pause ever so slightly to consider why the First Pulse happened in the first place. Carbon dioxide in the atmosphere traps heat in the atmosphere by way of the well-understood greenhouse effect; it closes a gap in the spectrum where reflected sunlight used to flash back out into space, and converts it to heat instead. It's like rolling up the windows on your car all the way on a hot day, as opposed to having them partly rolled down. Not really, but close enough to elucidate if you haven't gotten it yet. So okay, that trapped heat in the atmosphere transfers very easily and naturally to the oceans, warming ocean water. Ocean water circulates, and the warmed surface water gets pushed down eventually to lower levels. Not to the bottom, not even close, but lower. The heat itself expands the water of the ocean a bit, raising sea level some,

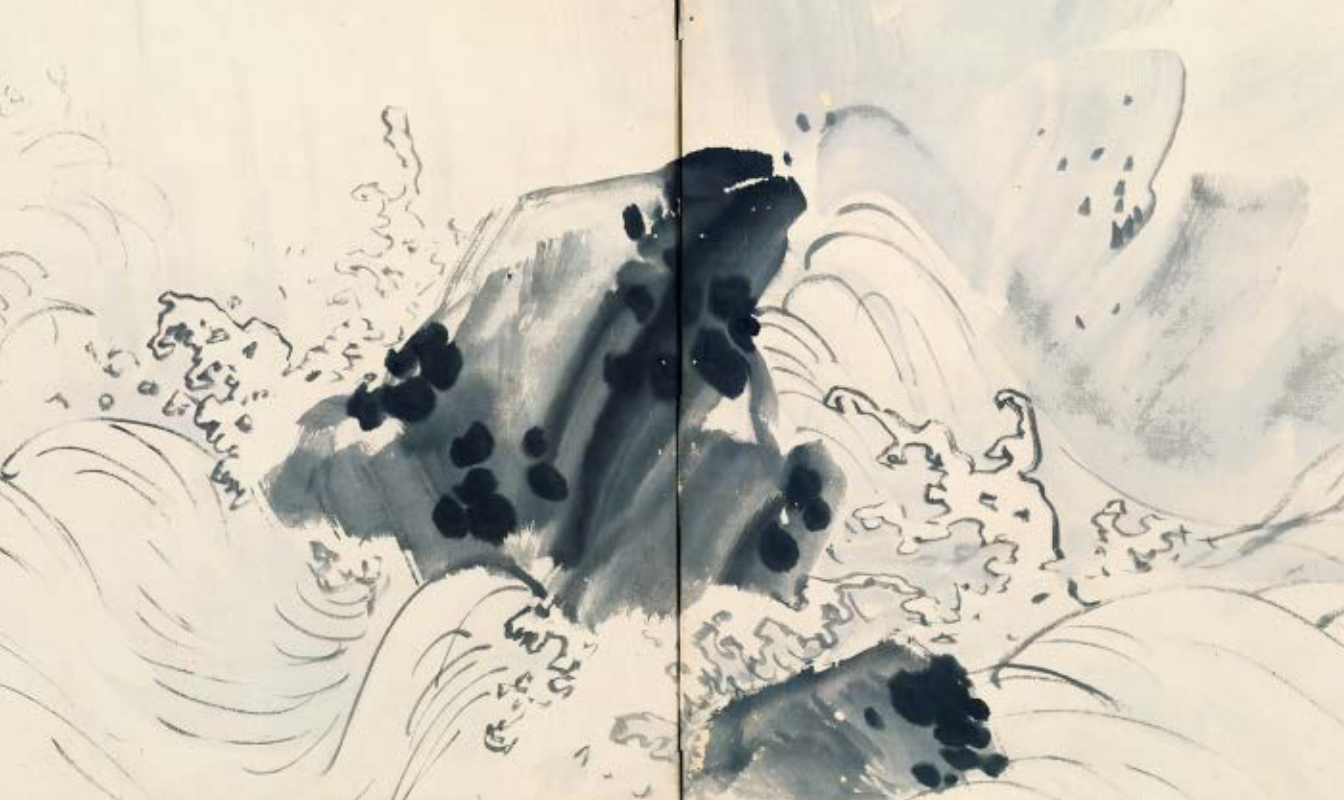
but that's not the important part. The important part is that those warmer ocean currents circulate all over, including around Antarctica, which sits down at the bottom of the world like a big cake of ice. A really big cake of ice. Melt all that ice and pour it in the ocean (though it pours itself) and sea level would go 270 feet higher than the old Holocene level.

So: the First Pulse was mostly the Wilkes/Victoria Basin, also Greenland, also West Antarctica, another less massive but consequential contributor, as its basins lay almost entirely below sea level, such that they were quick to break their buttresses and then float up on the subtruding ocean water and sail away. All this ice, breaking up and slumping into the sea. Years of greatest rise, 2052–61, and suddenly the ocean was ten feet higher. Oh no! How could it be?

Rates of change themselves change, that's how. Say the speed of melting doubles every ten years. How many decades before you are fucked? Not many. It resembles compound interest. Or recall the old story of the great Mogul emperor

Waterfall on Mont-Morency, by Robert Scott Duncanson, 1864.





Rock and Waves (detail), by Maruyama Okyo, 1773.

who was talked into repaying a peasant who had saved his life by giving the peasant one rice grain and then two, and doubling that again on every square of a chessboard. Possibly the grand vizier or chief astronomer advised this payment, or the canny peasant, and the unquant emperor said sure, good deal, rice grains, who cares, and started to dribble out the payment, having been well trained in counting rice grains by a certain passing Serbian dervish woman. A couple few rows into the chessboard, he sees how he's been had and has the vizier or astronomer or peasant beheaded. Maybe all three, that would be imperial style. The one percent get nasty when their assets are threatened.

So that's how it happened with the First Pulse. Big surprise. What about the Second Pulse, you ask? Don't ask. It was just more of the same, but doubled as everything loosened in the increasing warmth and the higher seas. Mainly the Aurora Basin's buttress let loose, and its ice flowed down the Totten Glacier. The Aurora was a basin even bigger than Wilkes/Victoria. And then, with sea level raised fifteen feet, then twenty feet, *all* the buttresses of the buttresses lost their footing all the way around the Ant-

arctic continent, after which said buttresses were shoved from behind into the sea, after which gravity had its way with the ice in all the basins all around East Antarctica, and the ice resting on ground below sea level in West Antarctica, and all that ice quickly melted when it hit water, and even when it was still ice and floating, often in the form of tabular bergs the size of major nations, it was already displacing the ocean by as much as it would when it finished melting. Why that should be is left as an exercise for the reader to solve, after which you can run naked from your leaky bath crying, Eureka!

It is worth adding that the Second Pulse was a lot worse than the first in its effects, because the total rise in sea level ended up at around fifty feet. This truly thrashed all the coastlines of the world, causing a refugee crisis rated at ten thousand katrinas. One-eighth of the world's population lived near coastlines and were more or less directly impacted, as was fishing and aquaculture, meaning one-third of humanity's food, plus a fair bit of coastal (meaning, in effect, rained-upon) agriculture, as well as the aforementioned shipping. And with shipping forestalled, thus impacting world

trade, the basis for that humming neoliberal global success story that had done so much for so few was also thrashed. Never had so much been done to so many by so few!

All that happened very quickly, in the very last years of the twenty-first century. Apocalyptic, Armageddonesque, pick your adjective of choice. Anthropogenic could be one. Extinctional another. Anthropogenic mass extinction event, the term often used. End of an era. Geologically speaking, it might rather be the end of an age, period, epoch, or eon, but that can't be decided until it has run its full course, so the common phrase *end of an era* is acceptable for the next billion or so years, after which we can revise the name appropriately.

But hey. An end is a beginning! Creative destruction, right? Apply more police state and more austerity, clamp down hard, proceed as before. Cleaning up the mess a great investment opportunity! Churn, baby, churn!

It's true that the newly drowned coastlines, at first abandoned, were quickly reoccupied by desperate scavengers and squatters and fisherpeople and so on, the water rats as they were called among many other humorous names. There were a lot of these people, and a lot of them were what you might call radicalized by their experiences. And although basic services like electricity, water, sewage, and police were at first gone, a lot of infrastructure was still there, amphibiously enduring in the new shallows, or getting repeatedly flushed and emptied in the zones between low and high tide. Immediately, as an integral part of the natural human response to tragedy and disaster, law-suits proliferated. Many concerned the status of this drowned land, which it had to be admitted was now actually, and even perhaps technically, meaning legally, the shallows of the ocean, such that possibly the laws defining and regulating it were not the same as they had been when the areas in question were actual land. But since it was all wrecked anyway, the people in Denver didn't really care. Nor the people in Beijing, who could look around at Hong Kong and London and Washington, DC, and São Paulo and To-

kio and so on, all around the globe, and say, Oh dear! What a bummer for you, good luck to you! We will help you all we can, especially here at home in China, but anywhere else also, and at a reduced rate of interest if you care to sign here.

And they may also have felt, along with everyone in that certain lucky one percent, that some social experimentation at the drowned margin might let off some steam from certain irate populaces, social steam that might even accidentally innovate something useful. So in the immortal words of Bertolt Brecht, they "dismissed the people and elected another one," i.e., moved to Denver, and left the water rats to sort it out as best they could. An experiment in living wet. Wait and see what those crazy

Every memory everyone has ever had will eventually be underwater.

—Anthony Doerr, 2006

people did with it, and if it was good, buy it. As always, right? You brave, bold, hip, and utterly co-opted avant-gardists, you know it already, whether you're reading this in 2144 or 2312 or 3333 or 6666.

So there you have it. Hard to believe, but these things happen. In the immortal words of whoever, "History is just one damned thing after another." Except if it was Henry Ford who said that, cancel. But he's the one who said, "History is bunk." Not the same thing at all. In fact, cancel both those stupid and cynical sayings. History is humankind trying to get a grip. Obviously not easy. But it could go better if you would pay a little more attention to certain details, like for instance your planet.

From New York 2140. "I thought of the book eventually as a comedy of coping, and to do that I picked a time, perhaps forty years after the disaster itself," Robinson said of his speculative novel about life in a flooded New York City. "I think, at some point, science fiction has to imagine the people who come after, when the situation will be natural, whatever it is." Best known for his trilogy of novels about an attempt to build an equitable human society on Mars, Robinson lives in a cohousing community in Davis, California.

C. 1957: Utah

INTO THE MYSTIC

In July and August on the high desert the thunderstorms come. Mornings begin clear and dazzling bright, the sky as blue as the Virgin's cloak, unflawed by a trace of cloud in all that emptiness bounded on the north by the Book Cliffs, on the east by Grand Mesa and the La Sal Mountains, on the south by the Blue Mountains, and on the west by the dragon-tooth reef of the San Rafael. By noon, however, clouds begin to form over the mountains, coming it seems out of nowhere, out of nothing, a special creation.

To gaze upon a drop of water is to behold the nature of all the waters of the universe.
—Huangbo Xiyun, c. 850

The clouds multiply and merge, cumulonimbi piling up like whipped cream, like mashed potatoes, like sea foam, building upon one another into a second mountain range greater in magnitude than the terrestrial range below.

The massive forms jostle and grate, ions collide, and the sound of thunder is heard over the sun-drenched land. More clouds emerge from empty sky, anvil-headed giants with glints of lightning in their depths. An armada assembles and advances, floating on a plane of air that makes it appear, from below, as a fleet of ships must look to the fish in the sea.

At my observation point on a sandstone monolith, the sun is blazing down as intensely as ever, the air crackling with dry heat. But the storm clouds continue to spread, gradually taking over more and more of the sky, and as they approach, the battle breaks out.

Lightning streaks like gunfire through the clouds, volleys of thunder shake the air. A smell of ozone. While the clouds exchange their bolts with one another, no rain falls, but now they begin bombarding the buttes and pinnacles below. Forks of lightning—illuminated nerves—join heaven and earth.

The wind is rising. For anyone with sense enough to get out of the rain, now is the time to seek shelter. A lash of lightning flickers over Wilson Mesa, scorching the brush, splitting a pine tree. Northeast over the Yellowcat area, rain is already sweeping down, falling not vertically but in a graceful curve, like a beaded curtain drawn lightly across the desert. Between the rain and the mountains, among the tumbled masses of vapor, floats a segment of a rainbow—sunlight divided. But where I stand, the storm is only beginning.

Above me the clouds roll in, unfurling and smoking billows in malignant violet, dense as wool. Most of the sky is lidded over, but the sun remains clear halfway down the west, shining in under the storm. Overhead the clouds thicken, then crack and split with a roar like that of cannonballs tumbling down a marble staircase; their bellies open—too late to run now—and the rain comes down.

Comes down: not softly, not gently, with no quality of mercy, but like heavy water in buckets, raindrops like pellets splattering on the rock, knocking the berries off the junipers, plastering my shirt to my back, drumming on my hat like hailstones, and running in a waterfall off the brim.

The pinnacles, arches, balanced rocks, fins, and elephant backs of sandstone, glazed with water but still in sunlight, gleam like old gray silver, and everything appears transfixed in the strange, wild, unholy light of the moment. The light that never was.

For five minutes the deluge continues under the barrage of thunder and lightning, then trails off quickly, diminishing to a shower, to a sprinkling, to nothing at all. The clouds move off and rumble for a while in the distance. A fresh golden light breaks through, and now in the east, over the turrets and domes, stands the rainbow sign, a double rainbow with one foot in the canyon of the Colorado and the other far north in Salt Wash. Beyond the rainbow and framed within it, I can see jags of lightning still playing in the stormy sky over Castle Valley.

The afternoon sun falls lower; above the mountains and the ragged black clouds hangs



Untitled (Man on Horse in Rio Grande), Big Bend National Park, Texas, by Victoria Sambunaris, 2009. Chromogenic print.

the new moon, pale fragment of what is to come; in another hour, at sundown, Venus, too, will be there, planet of love, to glow bright as chromium down on the western sky. The desert storm is over, and through the pure sweet pellucid air, the cliff swallows and the nighthawks plunge and swerve, making cries of hunger and warning and—who knows?—maybe of exultation.

Stranger than the storms, though not so grand and symphonic, are the flash floods that follow them, bursting with little warning out of the hills and canyons, sometimes an hour or more after the rain has stopped.

I have stood in the middle of a broad sandy wash with not a trickle of moisture to be seen anywhere, sunlight pouring down on me and on the flies and ants and lizards, the sky above perfectly clear, listening to a queer vibration in the air and in the ground under my feet—like a

freight train coming down the grade, very fast—and looked up to see a wall of water tumble around a bend and surge toward me.

A wall of water. A poor image. For the flash flood of the desert poorly resembles water. It looks rather like a loose pudding or a thick dense soup, thick as gravy, dense with mud and sand, lathered with scuds of bloody froth, loaded on its crest with a tangle of weeds and shrubs and small trees ripped from their roots.

Surprised by delight, I stood there in the heat, the bright sun, the quiet afternoon, and watched the monster roll and roar toward me. It advanced in crescent shape with a sort of fore-lip about a foot high streaming in front, making hissing sucking noises like a giant amoeba, nosing to the right and nosing to the left as if on the spoor of something good to eat. Red as tomato soup or blood, it came down on me about as fast



Bathing Party, by William P. Chappel, c. 1875.

as a man could run. I moved aside and watched
it go by.

A flick of lightning to the north
where dun clouds grumble—
while here in the middle of the wash
black beetles tumble
and horned toads fumble
over sand as dry as bone
and hard-baked mud and glaring stone.

Nothing here suggests disaster
for the ants' shrewd play;
their busy commerce for tomorrow
shows no care for today;
but a mile away
and rolling closer in a scum of mud
comes the hissing lapping blind mouth
of the flood.

Through the tamarisk whine the flies
in pure fat units of conceit
as if the sun and the afternoon
and blood and the smells and the heat
and something to eat
would be available forever, never die
beyond the fixed imagination of a fly.

The flood comes, crawls thickly by,
roaring
with self-applause, a brown
spongy smothering liquid avalanche:
great ant civilizations drown,
worlds go down,
trees go under, the mud bank breaks
and deep down underneath the bedrock
shakes.

A few hours later the bulk of the flood was
past and gone. The flow dwindled to a trickle
over bars of quicksand. New swarms of insect
life would soon come to recover the provinces
of those swept away. Nothing had changed but
the personnel, a normal turnover, and the con-
tours of the watercourse, that not much.

Edward Abbey, from *Desert Solitaire*. Based on Abbey's experience in the late 1950s as a park ranger in what is now Arches National Park in Utah, the author's first book of nonfiction was written "with a deep undercurrent of bitterness," according to naturalist Edwin Way Teale. "Most of what I write about in this book is already gone or going under fast," Abbey said in 1967. "This is not a travel guide but an elegy." Abbey's subsequent work became an inspiration for the Earth Liberation Front, which the FBI designates a terrorist group.

C. 2500 BC: Sumer

SMALL CRAFT ADVISORY

Gilgamesh spoke and said then to the boatman,
“Tell me the way to find the only one

of men by means of whom I might find out
how death can be avoided. Tell me the way.

What are the signs of the way to Utnapishtim?
If I must cross the waters of death, I will.

If not, I will wander in unknown places, seeking.”
Urshanabi replied to Gilgamesh,

“With your own hands, you have made the crossing harder.
You broke the talismans, you broke the Stone Things;

you took the Urnu Snakes, which is forbidden.
Take up your ax, go back into the forest.

Cut sixty poles and then cut sixty more,
each pole of sixty cubits; fit them with rings

to strengthen them for poling; find pitch
to seal the wood against the waters of death.

When you have finished, bring me back the poles.”
So Gilgamesh went back into the forest,

cut sixty poles and then cut sixty more,
banded the poles, and sealed them against the waters,

and then brought back to the boatman what he had made.
Then Gilgamesh and Urshanabi embarked

on the little boat and made the perilous journey,
by the third day sailing as far as would have been

a two months' sail for an ordinary boat.
And they arrived at the place of the waters of death.

Urshanabi then said to Gilgamesh,
“Let us make our way using the punting poles.

Be sure your hands touch nothing of the water.”
So Gilgamesh took up a punting pole

to pole the little boat through the waters of death,
and after a time the wooden pole was broken

because of the might of Gilgamesh the king
poling the little boat through the deadly waters.

And so it was with a second pole, and a third,
a fourth pole, a fifth, and a sixth, and a seventh also;

and so it was with sixty poles, and then
with a sixty-first, and sixty-second, and -third,

and a sixty-fourth, and -fifth, through the death waters,
till all the poles were broken because of his might.

Then Gilgamesh stripped himself and as a sail
held up the animal skin he had been wearing,

and so the little boat sailed on the waters.

From the Epic of Gilgamesh. The semihistorical king of Uruk in the twenty-sixth century BC, Gilgamesh is the hero of many Mesopotamian legends. In the best-known tale, the violent death of his friend Enkidu sets the king on a quest for eternal life. One version of the epic brings Gilgamesh to a tavern, where he explains his motivation to a bartender. "You will not find the eternal life you seek," she responds. "When the gods appointed death for mankind, they kept eternal life in their own hands. So, Gilgamesh, let your stomach be full, day and night enjoy yourself in every way."

Cosmetic spoon of a swimming woman holding an antelope-shaped dish, Egypt, early fourteenth century BC.



1927: Vicksburg, MS

WHEN THE LEVEE BREAKS

It was raining steadily now though still not hard, still without passion, the sky, the day itself dissolving without grief; the skiff moved in a nimbus, an aura of gray gauze which merged almost without demarcation with the roiling spittle-frothed debris-choked water. Now the day, the light, definitely began to end and the convict permitted himself an extra notch or two of effort because it suddenly seemed to him that the speed of the skiff had lessened. This was actually the case though the convict did not know it. He merely took it as a phenomenon of the increasing obfuscation, or at most as a result of the long day's continuous effort with no food, complicated by the ebbing and fluxing phases of anxiety and impotent rage at his absolutely gratuitous predicament. So he stepped up his stroke a beat or so, not from alarm but on the contrary, since he, too, had received that lift from the mere presence of a known stream, a river known by its ineradicable name to generations of men who had been drawn to live beside it as man always has been drawn to dwell beside water, even before he had a name for water and fire, drawn to the living water, the course of his destiny and his actual physical appearance rigidly coerced and postulated by it. So he was not alarmed. He paddled on, upstream without knowing it, unaware that all the water which for forty hours now had been pouring through the levee break to the north was somewhere ahead of him, on its way back to the river.

It was full dark now. That is, night had completely come, the gray dissolving sky had vanished, yet as though in perverse ratio surface visibility had sharpened, as though the light which the rain of the afternoon had washed out of the air had gathered upon the water as the rain itself had done, so that the yellow flood spread on before him now with a quality almost phosphorescent, right up to

the instant where vision ceased. The darkness in fact had its advantages; he could now stop seeing the rain. He and his garments had been wet for more than twenty-four hours now so he had long since stopped feeling it, and now that he could no longer see it either it had in a certain sense ceased for him. Also, he now had to make no effort even not to see the swell of his passenger's belly. So he was paddling on, strongly and steadily, not alarmed and not concerned but just exasperated because he had not yet begun to see any reflection on the clouds which would indicate the city or cities which he believed he was approaching but which were actually now miles

*There is nothing in the world more submissive
and weak than water. Yet for attacking that
which is hard and strong, nothing can surpass it.*
—Tao Te Ching, c. 500 BC

behind him, when he heard a sound. He did not know what it was because he had never heard it before and he would never be expected to hear such again since it is not given to every man to hear such at all and to none to hear it more than once in his life. And he was not alarmed now either because there was not time, for although the visibility ahead, for all its clarity, did not extend very far, yet in the next instant to the hearing he was also seeing something such as he had never seen before. This was that the sharp line where the phosphorescent water met the darkness was now about ten feet higher than it had been an instant before and that it was curled forward upon itself like a sheet of dough being rolled out for a pudding. It reared, stooping; the crest of it swirled like the mane of a galloping horse and, phosphorescent, too, fretted and flickered like fire. And while the woman huddled in the bows, aware or not aware the convict did not know which, he (the convict), his swollen and blood-streaked face gaped in an expression of aghast and incredulous amazement, continued to paddle

directly into it. Again he simply had not had time to order his rhythm-hypnotized muscles to cease. He continued to paddle though the skiff had ceased to move forward at all but seemed to be hanging in space while the paddle still reached thrust recovered and reached again; now instead of space the skiff became abruptly surrounded by a welter of fleeing debris—planks, small buildings, the bodies of drowned yet antic animals, entire trees leaping and diving like porpoises above which the skiff seemed to hover in weightless and airy indecision like a bird above a fleeing countryside, undecided where to light or whether to light at all, while the convict

I am not deeply versed in physical science, but there are certain things about water that fill me with wonder and amaze.

—H.G. Wells, 1919

squatted in it still going through the motions of paddling, waiting for an opportunity to scream. He never found it. For an instant the skiff seemed to stand erect on its stern and then shoot scrabbling and scrambling up the curling wall of water like a cat, and soared on above the licking crest itself and hung cradled into the high actual air in the limbs of a tree, from which bower of new-leafed boughs and branches the convict, like a bird in its nest and still waiting his chance to scream and still going through the motions of paddling though he no longer even had the paddle now, looked down upon a world turned to furious motion and in incredible retrograde.

Some time about midnight, accompanied by a rolling cannonade of thunder and lightning like a battery going into action, as though some forty hours' constipation of the elements, the firmament itself, were discharging in clapping and glaring salute to the ultimate acquiescence to desperate and furious motion, and still leading its charging welter of dead cows and mules and outhouses and cabins and hen coops, the skiff passed Vicks-

burg. The convict didn't know it. He wasn't looking high enough above the water; he still squatted, clutching the gunwales and glaring at the yellow turmoil about him out of which entire trees, the sharp gables of houses, the long mournful heads of mules which he fended off with a splintered length of plank snatched from he knew not where in passing (and which seemed to glare reproachfully back at him with sightless eyes, in limber-lipped and incredulous amazement) rolled up and then down again, the skiff now traveling forward now sideways now sternward, sometimes in the water, sometimes riding for yards upon the roofs of houses and trees and even upon the backs of the mules as though even in death they were not to escape that burden-bearing doom with which their eunuch race was cursed. But he didn't see Vicksburg; the skiff, traveling at express speed, was in a seething gut between soaring and dizzy banks with a glare of light above them but he did not see it; he saw the flotsam ahead of him divide violently and begin to climb upon itself, mounting, and he was sucked through the resulting gap too fast to recognize it as the trestling of a railroad bridge; for a horrible moment the skiff seemed to hang in static indecision before the looming flank of a steamboat as though undecided whether to climb over it or dive under it, then a hard icy wind filled with the smell and taste and sense of wet and boundless desolation blew upon him; the skiff made one long bounding lunge as the convict's native state, in a final paroxysm, regurgitated him onto the wild bosom of the Father of Waters.

William Faulkner, from "Old Man." Faulkner later included this story—whose name refers to the Mississippi River and whose plot follows the adventures of a prison inmate adrift with a pregnant woman during the Great Flood of 1927—in his novel *The Wild Palms*. During the flood, the river inundated the homes of nearly a million people, driving hundreds of thousands of African Americans from plantations to northern cities. According to the author, Yoknapatawtha is "a Chickasaw Indian word meaning 'water runs slow through flat land.'"



La Grenouillère, by Claude Monet, 1869.

1789: Iceland

JET SET

When our guides first led us to the geyser, the basin was filled to within a few feet of its edge. The water was transparent as crystal; a slight steam only arose from it, and the surface was ruffled but by a few bubbles, which now and then came from the bottom of the pipe. We waited with anxiety for several minutes, expecting at every instant some interruption to this tranquility. On a sudden, another spring, immediately in front of the place on which we were standing, darted its waters above a hundred feet into the air with the velocity of an arrow, and the jets succeeding this first eruption were still higher.

While gazing in silence and wonder at this unexpected and beautiful display, we were alarmed by a sudden shock of the ground under our feet, accompanied with a hollow noise, not unlike the distant firing of cannon. Another shock soon followed, and we observed the wa-

ter in the basin to be much agitated. The Icelanders hastily laid hold of us, and forced us to retreat some yards. The water in the meantime boiled violently and heaved as if some expansive power were laboring beneath its weight, and some of it was thrown up a few feet above the basin. Again there were two or three shocks of the ground and a repetition of the same noise. In an instant the surrounding atmosphere was filled with volumes of steam rolling over each other as they ascended, in a manner inexpressibly beautiful, and through which columns of water, shivering into foam, darted in rapid succession to heights which, at the time, we were little qualified to estimate. Indeed, the novelty and splendor of such a scene had affected our imaginations so forcibly that we believed the extreme height of the jet to be much greater than it was afterward determined to be. In a subsequent eruption, Mr. Baine ascertained, by means of a quadrant, the greatest elevation to which the jets of water were thrown to be ninety-six feet.



Vicissitudes, by Jason deCaires Taylor, 2006.

Much of the water began to descend again at different heights, and was again projected by other columns, which met it as they arose. At last, having filled the basin, it rolled in great waves over its edge and, forming numberless rills, made its way down the sides of the mound. Much was lost in vapor also, and still more fell to the ground in heavy showers of spray. The intervals at which the several jets succeeded each other were too short for the eye to distinguish them. As they rose out of the basin, they reflected, by their density, the purest and most brilliant blue. In certain shades, the color was green like that of the sea; but in their further ascent, all distinction of color was lost, and the jets, broken into a thousand parts, appeared white as snow. Several of them were forced upward perpendicularly; but many, receiving a slight inclination as they burst from the basin, were projected in beautiful curves, and the spray which fell from them, caught by a succeeding jet, was hurried away still higher than it had been perhaps before.

The jets were made with inconceivable velocity, and those which escaped uninterrupted terminated in sharp points and lost themselves in the air. The eruption, changing its form at

every instant and blending variously with the clouds of steam that surrounded it, continued for ten or twelve minutes; the water then subsided through the pipe and disappeared.

I cannot flatter myself that the description I have attempted of their eruptions will impress you with a just idea of their beauty. Sources of comparison are wanting, by which the portraiture of such extraordinary scenes can be assisted. Nature nowhere offers objects bearing a resemblance to them; and art, even in constructing the waterworks of Versailles, has produced nothing that can at all illustrate the magnificent appearances of the geyser. All then that I hope for is to have said so much as may enable you to complete in your imagination the picture which I have only sketched.

John Thomas Stanley, from *An Account of the Hot Springs near Haukadal in Iceland*. "The idea to travel to Iceland was suggested by a friend of Stanley's in 1788 while the young lord was studying at Edinburgh University. "When we go to Iceland" became at last a proverb to us," Stanley wrote in his journals, "and we talked of the geysers." Diaries of the trip reveal, according to a scholar, "an intriguing glimpse of that 'gothick' infatuation, armchair primitivism, and emerging Icelandophilia which gripped many an educated British consciousness at the end of the eighteenth century."

1993: Aswân

DROWNED WORLD

What did they want from him? It was an unanswerable question that occupied Awad Shalali the whole time it took them to get from Kalabsha to the Directorate of Security in Aswân. He did not remember doing anything that had harmed security in a place where the security was never disturbed at all. He'd had absolutely no contact with his old comrades. Had they gone back on their decision to grant him a pardon? Had there been troubles in the north? Were they rearresting people as a preemptive measure? He was not afraid. Nothing would happen to him—nothing worse than had already happened, anyway. The officer asked him the usual numbing questions:

"Your name in full?"

They were going to clash. He answered with a challenge in his voice.

"You want my real name?"

"Of course."

"Then write this down. My historical name is Taharqah. My homeland is the land of Nubia, which has been consumed by the pages of history. We were, but you made us not be. I have come to you to bring a lawsuit against the builders of the dam and the reservoir, and to seek my old borders, from Aswân to old Dongola, to establish a provisional government. I have decided on the color of our flag. It will be black, with the pupil of an eye in the middle, and arrows. We have no objection to union with the north, and we will put that on the table for negotiation. Write, officer. Why did you stop writing?"

The officer had indeed stopped writing and was staring at him in surprise and unease. He exchanged looks of amazement with the standing officer and the informant with him and with the intelligence officer who had been pacing the office irritably.

"What kind of nonsense is this?" the seated officer asked angrily.

"You hate the truth."

"What truth?"

The standing officer intervened. He opened the file of Awad Shalali and studied it closely. Then he moved closer to Awad and sniffed his mouth. He could not find a medical report in his file that explained this delirium, nor was there any smell of liquor to justify what he had just heard. A lawsuit against the builders of the dam? Good god, against whom? This was something far beyond madness. He decided not to believe his ears, and asked, "What did you say, my brother?"

"I said just what you heard, sir."

"Please explain it to me."

"I wasn't speaking Nubian, I was speaking Arabic."

"That was not Arabic, boy."

"So what was it?"

"The language of lunatics, fools, and clowns. We are here in a government office, and you're talking like you're in a bar or a drug den. I am going to ask you the same question myself. What is your name?"

"Don't waste your time, sir. I'm not going to say anything different."

"Fine, fine. Have a seat and get ready to meet our boss, the director. You're a lot of work, for sure."

He had been a lot of work ever since he started reading history. He had always demanded justice and equality. Now his quest was harsh and arduous, provocative and destructive, extracting the part from the whole, identity, separation. He drew and planned out the coming arena of battle in his head. He counted the armies of the Kanz, the Fadja, the Mahas, and the Danakils. He went back and forth, east and west, between the valleys and the mountains. Reporters would go from scene to scene, now describing it all as a revolution of the descendants of the Mahdi Revolt—which the British called the revolution of the dervishes—now as a new Revolt of the Zanj. He was determined that peace would be concluded on top of the High Dam. The revolution might fail, and then their severed heads would hang from the telegraph poles the whole length of the Upper

1717: London

A KING'S PLEASURE

On Wednesday evening at about eight, the king took water at Whitehall in an open barge and went up the river toward Chelsea. Many other barges with persons of quality attended, and so great a number of boats that the whole river in a manner was cover'd; a city company's barge was employ'd for the musick, wherein were fifty instruments of all sorts, who play'd all the way from Lambeth (while the barges drove with the tide without rowing, as far as Chelsea) the finest symphonies compos'd express for this occasion by Mr. Handel, which His Majesty liked so well that he caus'd it to be played over three times in going and returning. At eleven His Majesty went ashore at Chelsea, where a supper was prepar'd, and then there was another very fine consort of musick, which lasted till two, after which His Majesty came again into his barge and return'd the same way, the musick continuing to play till he landed.

An article in the Daily Courant. This newspaper account of the first performance of George Frideric Handel's Water Music, performed for George I of Great Britain, was published two days after the festivities. "The Water Music commission was surely not 'composed express for the occasion,' as the Daily Courant would have us believe," wrote British conductor Christopher Hogwood. "It would have been very unlike Handel to have resisted all recycling." In 1977 Walt Disney World's nightly Electrical Water Pageant began featuring selections from Water Music arranged for synthesizer.

Egyptian highway. A headache. A headache. They presented him to the official with the file. Another idiot like the others he had met in the wars and at Wahat. The peacocks retreated at the sight of the chair, which tottered backward.

"Listen, boy," he said threateningly. "Let me tell you the truth. I don't like communists, even if the government did make peace with you. My opinion always was that you should be executed because you are apostates, and Islam allows us to kill you. I could wipe you out of existence if you did anything foolish. I have reports that prove you are a secessionist and a troublemaker, and that is a much worse charge than the first one because you are endangering the peace of this country. The best thing for you

is to cooperate with me. Tell me the truth about your plans and ideas."

"The truth is, sir—"

"That's better."

"Give us back our old homeland."

"This is high politics!"

"Give us land fit for planting."

"And that is in the plan—"

"Build us factories."

"We will try—"

"Pay us compensation equal to what we lost."

"What more do you want?"

"Aren't we worth just as much as temples and statues?"

"My boy, these are things decided by the president of this country. It looks to me like you need some discipline."

"That's already been taken care of."

"What exactly do you want?"

"My people are tired of—"

"Talk about yourself."

"They are mute. The invaders have cut their tongues out."

"Be quiet."

"Has my master ordered me—"

"If you want to go back to your old country, we'll send you back immediately. But alone. Men, get a boat ready! And take this lunatic and drop him off in the farthest village in old Nubia, among the mad dogs and the beasts."

A sudden pang of alarm shot through Awad Shalali after the officer left the room to carry out this order. He pictured himself isolated and alone, being devoured by wolves. That would be a dramatic end, worse than Wahat, or being lashed to death. This idiot peacock could make it happen.

He was awakened from his daydream by the voice of his conqueror.

"What do you think now? With one movement of my hand, I can send out the bulletin that you're at large."

"Whatever you say."

"You've seen the light. I think we understand one another better now."

"Understand what?"

"Listen, my boy. We have no old feud between us. This is the first time I've ever dealt



The Fountain of Apollo and the Grand Canal at Versailles, anonymous gouache painting, c. 1705.

with you even though your name is on the blacklist. I could have had you expelled from the whole of Aswân the moment you arrived. I do not care about your red past. What bothers me is your black present. I heard about you from the mayor of your town. For your information, all the mayors and sheikhs and officials of Nubia are my friends. When I was young, you see, I worked in the police stations in al-Dur. I liked the people of Nubia, and they liked me. I'm a witness to their honesty, piety, and high morals. I do not know where you came from. If it weren't for my previous experience with your people, I would have turned you over to the security bureau, and that would have been the end of you. I am asking you to co-operate with us, and you won't be sorry. We'll get you your job back, or any other job of your choosing. What do you say?"

"But why?"

"That's all. We're through here."

"What is your command, sir?" asked the other officer breathlessly.

"We have forgiven him again, on my own responsibility."

"You are a very lucky man, sir. Thank the officer."

Awad felt his ulcers contract. He crossed the Aswân corniche like a lost wanderer. This city always provoked him. It had a suspect role in its ties to the south; this was the bridgehead for all invaders, and all the Rabi'a tribesmen had come through here. They called it the Gate of the Nile and had made up for its role and built the reservoir and the dam far from it. He felt a violent nostalgia for the sight of Nubia before its final immersion. On the following day, the spies double-crossed them and started operating a boat, with a Nubian pilot, between the dam and Abu Simbel to carry UNESCO experts. They saw desolate villages on both banks, with all the doors torn off. When they returned, the Nubian pilot asked their leave and approached the target, the homeland of Awad Shalali, the village of Qirshah, facing Jurf Hussein and Maria. A Kanzi village had been

relocated three times, as the reservoir rose, and then stayed there, on top of the mountain, until it was gradually submerged by the waters of the dam. This was the home of his childhood and memories. Here he had played and swum and made houses and dolls from the alluvial mud of the Nile. He chased the flocks of cranes that had flown from the lands of snow and ice.

He boarded the boat slowly at the inlet of Uliyat, stricken by memories, including the sounds of the ancient small villages: Juhurab, Danjarab, Shadnab, Harazah, Kilwa Dol, Ombo Kol, Hamaymtar, Naj al-Arab, Alyab, Jawharah, Qirshah, and Bayt Amudiyatha. Arabic, Pharaonic, and Nubian names, some of them meaningless. Some houses hugged the river, and others were closer to the mountains. In summer, when the river dropped and the land was visible, he went down with his mother to mow the couch grass and plant seeds. They sowed, but only rarely reaped. The north had glory and leisure; the south, death and floods. How many times had they been ruined by a flood coming out of season? Those days could never be forgotten, he said to the pilot. They drew nearer, approaching the end of the inlet by the bridge that connected two hamlets.

He got out and went up, climbing a hill. One of the experts took a photo of him. When another generation had passed, archaeologists and others would come and write lies. He climbed a little higher, then retreated impatiently. The mad dogs ran behind him, following him. He threw himself into the river and reboarded the boat. They were heading north. One of the experts asked him what the goal of his trip was. Awad ignored him and closed his eyes, recalling the words of Abdu Shindi, the warbling vocalist of the Kanz: *My land, my land*. As they progressed north, the villages slipped farther away, disappearing, and he was disappearing, too, and vanishing from existence. He only regained a sense of himself as the stupendous edifice loomed: the dam. He felt a rush of anguish.

Idris Ali, from Dongola. *The Aswān High Dam* displaced an estimated sixty thousand Nubians when completed on the Nile in 1970. The flooding, which created Lake Nasser, also required relocating the ancient Egyptian temple Abu Simbel. Ali grew up in Aswān before the dam's construction and studied at Al-Azhar University in Cairo. This 1993 novel was the first Nubian novel ever translated into English. In 1999 he won the Best Egyptian Novel prize for *The Explosion of the Skull*. He died in 2010.

Rainstorm—Cider Mill at Redding, Connecticut, by George Harvey, c. 1840.



1997: Ithaca, NY

RUN AGROUND

everything is

beautiful, they say, in its own way:
I don't think so: victimizers are

not beautiful: when they do things,
well, one's spine grinds with gritty

ice: but in the arc of arising or
in the depths of reaching down, it is

still true: each of us, even you,
even I, considered in the full

shadings of our dynamics, well, we
may be like what the Chinese

philosopher said about water, that
it never makes an esthetic mistake:

but I think the water of this movement
has run aground: I don't know which,

if any, part of the foregoing I
really believe: like water meeting

an obstacle, I will have to go around
or under it, or rise above it:

toodle-oo

A.R. Ammons, from Glare. "Ammons is our Lucretius," poet and translator Richard Howard has written, "swerving and side-swiping his way into the nature of things." Born in North Carolina in 1926, Ammons began writing poetry while serving on a U.S. Navy destroyer escort in the South Pacific during World War II. His debut collection, published in 1955, was the first of nearly thirty, including *Garbage* from 1993, which won a National Book Award, and *Glare*, from 1997, his final work. He died in 2001.

c. 97: Rome

PLUMBING

The maintenance of the aqueducts is worthy of special care, as it gives the best testimony to the greatness of the Roman Empire. The numerous and extensive works are continually falling into decay, and they must be attended to before they begin to demand extensive repair. Very often, however, it is best to exercise a wise restraint in attending to their upkeep, since those who urge the construction or extension of the works cannot always be trusted. The water commissioner, therefore, not only ought to be provided with competent advisers but ought also to be equipped

*There's folks 'ud hold a sieve under the pump
and expect to carry away the water.*

—George Eliot, 1859

with practical experience of his own. He must consult not only the architects of his own office but must also seek aid from the trustworthy and thorough knowledge of numerous other persons in order to judge what must be taken in hand immediately, and what postponed, and again, what is to be carried out by public contractors and what by his own regular workmen.

The necessity of repairs arises from the following reasons: damage is done either by the lawlessness of abutting proprietors, by age, by violent storms, or by defects in the original construction, which has happened quite frequently in the case of recent works.

I think no one will doubt that the greatest care should be taken with the aqueducts nearest to the city (I mean those inside the seventh milestone, which consist of block-stone masonry), both because they are structures of the greatest magnitude and because each one carries several conduits; for should it once be necessary to interrupt these, the city would be deprived of the greater part of its water supply. But there are methods for meeting even these difficulties: provisional works are built up to

the level of the conduit that is being put out of use, and a channel, formed of leaden troughs, running along the course of the portion that has been cut off, again provides a continuous passage. Furthermore, since almost all the aqueducts ran through the fields of private parties, and it seemed difficult to provide for future outlays without the help of some constituted law; in order, also, that contractors should not be prevented by proprietors from access to the conduits for the purpose of making repairs, a resolution of the Senate was passed.

But damages often occur by reason of the lawlessness of private owners, who injure the conduits in numerous ways. In the first place, they occupy with buildings or with trees the space around the aqueducts, which according to a resolution of the Senate should remain open. Trees do the most damage because their roots burst asunder the top coverings as well as the sides. They also lay out village and country roads over the aqueducts themselves. Finally, they shut off access to those coming to make repairs.

Our forefathers did not seize from private parties even those lands necessary for public purposes but, in the construction of waterworks, whenever a proprietor made any difficulty in the sale of a portion, they paid for the whole field and, after marking off the needed part, again sold the land with the understanding that public as well as private parties should, each within his boundaries, have his own full rights. But many have not been content to confine themselves to their limits and have laid hands on the aqueducts themselves by puncturing, here and there, the side walls of the channels, not merely those who have secured a right to draw water but also those who misuse the occasion of the least favor for attacking the walls of the conduits. What more would not be done were all those things not prevented by a carefully drawn law and were not the transgressors threatened with a serious penalty? Accordingly, I append the words of the law:

Whoever, after the passage of this law, shall maliciously and intentionally pierce,

Great Fountains

"No fountain is so small but that heaven may be imaged in its bosom."—Nathaniel Hawthorne



Fountain of Apollo

Versailles, 1671

Designed by Charles Le Brun; the lead statues were built at Gobelins Manufactory between 1668 and 1670, then transported to Versailles and gilded on-site.

Patio de la Acequia

Generalife, Granada, 1319

Built by Nasrid rulers outside Alhambra; much altered during Christian era.



Trevi Fountain

Rome, 1732

In 2016 tourists tossed \$1.4 million into the fountain.

The fine for jumping into it doubled in 2015, to 400 euros.

King Fahd's Fountain

Jidda, Saudi Arabia, 1985

Shoots water a thousand feet above the Red Sea; advertised as the world's tallest fountain.



Expo '70 Fountains

Osaka, 1970

Designed by Isamu Noguchi, nine fountains appear to float midair.



Meyer Circle Sea Horse Fountain

Ward Parkway, Kansas City, Missouri, 1925

The only city in the world with more fountains: Rome.

Da Shui Fa Grand Waterworks

Beijing, 1751

Designed by a Jesuit at the court of the Qianlong Emperor; burned down by Anglo-French troops in the Second Opium War, 1860.



Barmaley Fountain

Volgograd, 1939

Depicts children dancing around a crocodile named Barmaley. Destroyed by German bombers in 1942; restored in 2013.

Fountain

New York City, 1917

Marcel Duchamp submits a urinal (signed "R. Mutt") to New York City's Society of Independent Artists. "The *Fountain* may be a very useful object in its place," writes the board in rejection, "but its place is not in an art exhibition and it is, by no definition, a work of art." The original has been lost.



break, or countenance the attempt to pierce or break, the channels, conduits, arches, pipes, tubes, reservoirs, or basins of the public waters that are brought into the city, or who shall do damage with intent to prevent watercourses or any portion of them from going, falling, flowing, reaching, or being conducted into the city of Rome; or so as to prevent the issue, distribution, allotment, or discharge into reservoirs or basins of any water at Rome or in those places or buildings that are now or shall hereafter be adjacent to the city, or in the gardens, properties, or estates of

those owners or proprietors to whom the water is now or in future shall be given or granted, he shall be condemned to pay a fine of a hundred thousand sesterces to the Roman people. In addition, whoever shall maliciously do any of these things shall be condemned to repair, restore, re-establish, reconstruct, or replace what he has damaged, and quickly demolish what he has built—all in good faith and in such manner as the commissioners may determine. Further, whoever is or shall be water commissioner or, in default of such officer, that praetor who is charged with



Nude Figure on Hands and Knees, by Auguste Rodin, c. 1905.

judging between citizens and strangers, is authorized to fine, bind over by bail, or restrain the offender. Nothing of this law shall revoke the privilege of pasturing cattle, cutting grass or hay, or gathering brambles in this place. The water commissioners, present or future, in any place now enclosed about any springs, arches, walls, channels, or conduits are authorized to have removed, pulled out, dug up, or uprooted, any trees, vines, briars, brambles, banks, fences, willow thickets, or beds of reeds so far as they are ready to proceed with justice. To that end, they shall possess the right to bind over, impose fines, or restrain the offender; and it shall be their privilege, right, and power to do the same without prejudice.

I should call the transgressor of so beneficent a law worthy of the threatened punishment. But

those who had been lulled into confidence by long-standing neglect had to be brought back by gentle means to right conduct. I therefore endeavored with diligence to have the erring ones remain unknown as far as possible. Those who sought the emperor's pardon, after due warning received, may thank me for the favor granted. But for the future, I hope that the execution of the law may not be necessary, since it will be advisable for me to maintain the honor of my office even at the risk of giving offense.

Sextus Julius Frontinus, from *On the Aqueducts*. In 97, two decades after serving as governor of Britain, Frontinus was appointed water commissioner of Rome, which he described as concerning "not merely the convenience but also the health and even the safety of the city." Beyond providing technical information, this treatise is believed to have warned wealthy landowners that unauthorized tapping of aqueduct conduits for private use would no longer be tolerated. The text is known from a manuscript copied by scholar Poggio Bracciolini at Monte Cassino in 1429.

371: Moselle River

ON THE WATERFRONT

How nice it is to watch the oarsmen
row their boats together in the river
weaving makeshift pageants on the water.
They circle in and out and build a dance
that touches the sedge growing by the shore.
The bargemen run from bow to stern like boys
playing their summer games, and the farmer
rests his back and gaily watches these feats
of skill played on the river's flat surface.
While he watches, the farmer can forget
the setting sun and the cares of his land.
All things—river, painted boats—give these lads
that appearance which only youth can wear.

When Hyperion unleashes the heat
of the sun, the crystal surface reflects
the crews as crooked and upended men.
While the oarsmen force their hands back and forth,
the rippling water parodies their strength.
The boys take delight in these illusive
images the river gives back to them.
When they see this mockery, the sailors
are each innocent as a growing child
who has never seen a mirror and thinks
the image he sees is another boy.
This inexperienced infant would like
to smooth reflected hair, straighten the shirt,
and would even kiss the polished mirror.
The boys on the boats while their time away
with shapes that are sometimes true, often false.

But where the shores can be easily reached
no fish is safe from the fisherman's skill.
The deep pools and devious currents seem
defense enough, almost sanctuary,
yet this false security is shattered
with each foot splashing across the surface.
One man out on a sandbar balances
himself and his nets against a current
that sweeps up innocent fish like a broom
and at the same time makes the hook wiggle
like a drowning insect teasing a fish.
Nets buoyed up by corks, hooks dragged down by lead,
the river's water betrays the dumb fish.

No fish has ever told another of danger
lurking in those knit fabrics or drawn wire—
the bite of iron in the soft gullet
or the pinch of linen cords at the gills—
the green wand bows to the fish it has caught,
the dutiful corks bob in pert respect.

Unthinking, excited, the hungry boy
whips his catch from the stream onto the grass,
and I think of a scourge falling on flesh.
Under the water a fish is alive,
but in the sun he will strangle in air.
The dying body quivers helplessly,
the tail is feeble, the mouth is open;
the gills cannot breathe out life in that gasp
every animal tries to make at death.
Those shining gill covers once were beating
like a bellows in a blacksmith's workshop.
Now these gills cannot use the air they suck.
Then again, I have seen fish almost dead
leap up high into the air like tumblers
and throw themselves back into the water,
swimming off, to the fisherman's surprise.
When this happens the boy will make a dive
and try to catch him as he swims away.
Glaucus was stunned to see his catch of fish
flip themselves back into the waiting sea.
He tasted the herbs the fish had laid on
and found he could not avoid the ocean
but would be happy to live as a fish.
All these strange things I think of when I see
those young boys try to catch a fleeing fish.

These scenes are acted along shores and banks
within sight of old country estates perched
high on the crumbling cliffs that overlook
a quiet valley and a rolling stream.

Decimus Magnus Ausonius, from *"The Moselle."*
Having gained renown for his success in Latin prose and verse competitions, the rhetorician was selected to become tutor for future emperor Gratian. In this capacity, he was impelled to accompany his pupil as part of the imperial court during Emperor Valentinian's German campaigns, undertaken to consolidate Roman presence on the banks of the Rhine. This tribute to the Moselle, the Rhine's left tributary, was intended as calming propaganda that would project a sense of peace and security throughout the region.

2009: Fiji

NATIONAL INTEREST

The internet café in the Fijian capital, Suva, was usually open all night long. Dimly lit, with rows of sleek modern terminals, the place was packed at all hours with teenage boys playing boisterous rounds of video games. But one day soon after I arrived, the staff told me they now had to shut down by five PM. Police orders, they shrugged: the country's military junta had declared martial law a few days before, and things were a bit tense.

I sat down and sent out a few emails—filling friends in on my visit to the Fiji Water bottling plant, forwarding a story about foreign journalists being kicked off the island. Then my connection died. “It will just be a few minutes,” one of the clerks said.

Moments later, a pair of police officers walked in. They headed for a woman at another terminal; I turned to my screen to compose a note about how cops were even showing up in

the internet cafés. Then I saw them coming toward me. “We’re going to take you in for questioning about the emails you’ve been writing,” they said.

What followed, in a windowless room at the main police station, felt like a bad cop movie. “Who are you really?” the bespectacled inspector wearing a khaki uniform and a smug grin asked me over and over, as if my passport, press credentials, and stacks of notes about Fiji Water weren’t sufficient clues to my identity. (My iPod, he surmised tensely, was “good for transmitting information.”) I asked him to call my editors, even a UN official who could vouch for me. “Shut up!” he snapped. He rifled through my bags, read my notebooks and emails. “I’d hate to see a young lady like you go into a jail full of men,” he averred, smiling grimly. “You know what happened to women during the 2000 coup, don’t you?”

Eventually, it dawned on me that his concern wasn’t just with my potentially seditious emails; he was worried that my reporting would

Rainy Windows, by Anastasia Samoylova, 2013. Pigment print, 30 x 40 inches.



1846: Concord, MA

ICE BREAKERS

When I strolled around the pond in misty weather, I was sometimes amused by the primitive mode which some ruder fisherman had adopted. He would perhaps have placed alder branches over the narrow holes in the ice, which were four or five rods apart and an equal distance from the shore, and having fastened the end of the line to a stick to prevent its being pulled through, have passed the slack line over a twig of the alder, a foot or more above the ice, and tied a dry oak leaf to it, which, being pulled down, would show when he had a bite. These alders loomed through the mist at regular intervals as you walked halfway around the pond.

Ah, the pickerel of Walden! When I see them lying on the ice, or in the well which the fisherman cuts in the ice, making a little hole to admit the water, I am always surprised by their rare beauty, as if they were fabulous fishes, they are so foreign to the streets, even to the woods, foreign as Arabia to our Concord life. They possess a quite dazzling and transcendent beauty which separates them by a wide interval from the cadaverous cod and haddock whose fame is trumpeted in our streets. They are not green like the pines, nor gray like the stones, nor blue like the sky; but they have, to my eyes, if possible, yet rarer colors, like flowers and precious stones, as if they were the pearls, the animalized nuclei or crystals of the Walden water. They, of course, are Walden all over and all through; are themselves small Waldens in the animal kingdom, Waldenses. It is surprising that they are caught here—that in this deep and capacious spring, far beneath the rattling teams and chaises and tinkling sleighs that travel the Walden road, this great gold and emerald fish swims. I never chanced to see its kind in any market; it would be the cynosure of all eyes there. Easily, with a few convulsive quirks, they give up their watery ghosts, like a mortal translated before his time to the thin air of heaven.

Henry David Thoreau, from *Walden*. *Thoreau spent two years, two months, and two days in the cabin he built at Walden Pond near his native Concord. During the winter of 1846, he watched as a hundred Irish immigrants working for the Tudor Ice Company cut ten thousand tons of ice from the pond. The ice was subsequently shipped around the world. "Thus it appears," he reports elsewhere in Walden, "that the sweltering inhabitants of Charleston and New Orleans, of Madras and Bombay and Calcutta, drink at my well."*

taint the Fiji Water brand. "Who do you work for, another water company? It would be good to come here and try to take away Fiji Water's business, wouldn't it?" Then he switched tacks and offered to protect me—from other Fijian officials, who he said would soon be after me—by letting me go so I could leave the country. I walked out into the muggy morning, hid in a stairwell, and called a Fijian friend. Within minutes a U.S. embassy van was speeding toward me on the seawall.

Until that day, I hadn't fully appreciated the paranoia of Fiji's military regime. The junta had been declared unconstitutional the previous week by the country's second highest court; in response it had abolished the judiciary, banned unauthorized public gatherings, delayed elections until 2014, and clamped down on the media. (Only the "journalism of hope" is now permitted.) The prime minister, Commodore Frank Bainimarama, promised to root out corruption and bring democracy to a country that has seen four coups in the past twenty-five years; the government said it will start working on a new constitution in 2012.

The slogan on Fiji Water's website—"And remember this—we saved you a trip to Fiji"—suddenly felt like a dark joke. Every day more soldiers showed up on the streets. When I called the courthouse, not a single official would give me his name. Even tour guides were running scared—one told me that one of his colleagues had been picked up and beaten for talking politics with tourists. When I later asked Fiji Water spokesman Rob Six what the company thought of all this, he said the policy was not to comment on the government "unless something really affects us." The reality of Fiji, the country, has been eclipsed by the glistening brand of Fiji, the water.

On the map, Fiji looks as if someone dropped a fistful of confetti on the ocean. The country is made up of more than three hundred islands (a hundred inhabited) that have provided the setting for everything from *The Blue Lagoon* to *Survivor* to *Cast Away*. Suva is a bustling multicultural hub with a mix of shopping centers, colonial buildings, and curry houses; some 40 percent of the population is of Indian ancestry,

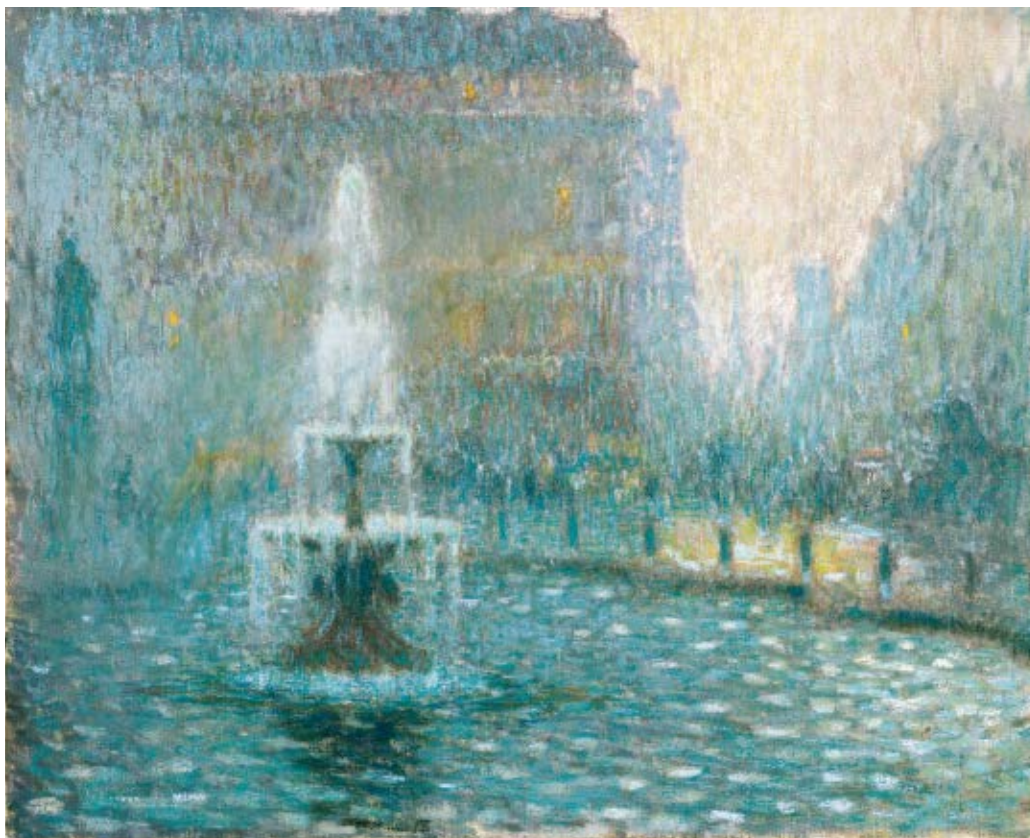
descendants of indentured sugarcane workers brought in by the British in the mid-nineteenth century. (The Indian-descended and native communities have been wrangling for power ever since.) The primary industries are tourism and sugar. In 2009, Fiji Water said its operations make up about 20 percent of exports and 3 percent of GDP, which stands at \$3,900 per capita.

Getting to the Fiji Water factory requires a bone-jarring four-hour trek into the volcanic foothills of the Yaqara Valley. My bus' speakers blasted an earsplitting soundtrack of Fijian reggae, Bob Marley, Tupac, and Big Daddy Kane as we swerved up unpaved mountain roads linked by rickety wooden bridges. Cow pastures ringed by palm trees gave way to villages of corrugated-metal shacks and wooden homes painted in Technicolor hues. Chickens scurried past stands selling cell phone minutes. Sugarcane stalks burning in the fields sent a sweet smoke curling into the air.

Our last rest stop, half an hour from the bottling plant, was Rakiraki, a small town with a square of dusty shops and a marketplace advertising COFFIN BOX FOR SALE—CHEAPEST IN TOWN. My *Lonely Planet* guide warned that Rakiraki water “has been deemed unfit for human consumption,” and groceries were stocked with Fiji Water going for ninety cents a pint—almost as much as it costs in the U.S.

Rakiraki has experienced the full range of Fiji's water problems—crumbling pipes, a lack of adequate wells, dysfunctional or flooded water treatment plants, and droughts that are expected to get worse with climate change. Half the country has at times relied on emergency water supplies, with rations as low as four gallons a week per family; dirty water has led to outbreaks of typhoid and parasitic infections. Patients have reportedly had to cart their own water to hospitals, and schoolchildren complain about their pipes spewing shells, leaves,

Trafalgar Square, by Henri Le Sidaner, late nineteenth or early twentieth century.





The Strange Thing Little Kiosai Saw in the River, by John La Farge, 1897.

and frogs. Some Fijians have taken to smashing open fire hydrants and bribing water truck drivers for a regular supply.

The bus dropped me off at a deserted intersection, where a weather-beaten sign warning off would-be trespassers in English, Fijian, and Hindi rattled in the tropical wind. Once I reached the plant, the bucolic quiet gave way to the hum of machinery spitting out some fifty thousand square bottles (made on the spot with plastic imported from China) per hour. The production process spreads across two factory floors, blowing, filling, capping, labeling, and shrink-wrapping twenty-four hours a day, five days a week. The company won't disclose its total sales.

From here the bottles are shipped to the four corners of the globe; the company—which, unlike most of its competitors, offers detailed carbon-footprint estimates on its website—insists that they travel on ships that would be making the trip anyway, and that the Fiji payload causes them to use only 2 percent more fuel.

Fiji Water has trademarked the word *FII* (in capital letters) in numerous countries. (Some rejected the application, but not the United States.) It has also gone after rival Fijian bottlers

daring to use their country's name for marketing. "It would have cost too much money for us to fight in court," says Mohammed Altaaf, the owner of Aqua Pacific water, which ended up taking the word *Fiji* out of its name. "It's just like branding a water America Water and denying anyone else the right to use the name 'America.'"

When such practices are criticized, Fiji Water's response is simple: "They don't have a ton of options for economic development," former senior VP of sustainable growth Thomas Mooney told *U.S. News & World Report*, "but bottled water is one of them. When someone buys a bottle of Fiji, they're buying prosperity for the country." Without Fiji Water, he said, "Fiji is kind of screwed."

Anna Lenzer, from *"Fiji Water: Spin the Bottle."* "They're brilliant marketers," Lenzer, a reporter on water issues, said about Fiji Water and its campaign to make its product seem environmentally friendly, "and you've got to give them that." In 2010 the company briefly stopped operations after the island upped its water tax on extraction; after returning to market, the bottled water again became the top-selling brand in the United States. In 2018 an internet video circulated of President Trump using two hands to slurp bottled water at a press conference. The water was from Fiji.

1992: Venice

WAVE THEORY

I always adhered to the idea that God is time, or at least that his spirit is. Perhaps this idea was even of my own manufacture, but now I don't remember. In any case, I always thought that if the spirit of God moved upon the face of the water, the water was bound to reflect it. Hence my sentiment for water, for its folds, wrinkles, and ripples, and—as I am a Northerner—for its grayness. I simply think that water is the image of time, and every New Year's Eve, in somewhat pagan fashion, I try to find myself near water, preferably near a sea or an ocean, to watch the emergence of a new helping, a new cupful of time from it. I am not looking for a naked maiden riding on a shell; I am looking for either a cloud or the crest of a wave hitting the shore at midnight. That, to me, is time coming out of water, and I stare at the lacelike pattern it puts on the shore, not with a gypsylike knowing, but with tenderness and with gratitude.

This is the way, and in my case the why, I set my eyes on this city. There is nothing Freudian to this fantasy, or specifically chordate, although some evolutionary—if not plainly atavistic—or autobiographical connection could no doubt be established between the pattern a wave leaves upon the sand and its scrutiny by a descendant of the ichthyosaur, and a monster himself. The upright lace of Venetian facades is the best line time—alias—water has left on terra firma anywhere. Plus, there is no doubt a correspondence between—if not an outright dependence on—the rectangular nature of that lace's displays—i.e., local buildings—and the anarchy of water that spurns the notion of shape. It is as though space, cognizant here more than anyplace else of its inferiority to time, answers it with the only property time doesn't possess: with beauty. And that's why water takes this answer, twists it, wallows and shreds it, but ultimately carries it by and large intact off into the Adriatic.

The eye in this city acquires an autonomy similar to that of a tear. The only difference is that

it doesn't sever itself from the body but subordinates it totally. After a while—on the third or fourth day here—the body starts to regard itself as merely the eye's carrier, as a kind of submarine to its now dilating, now squinting periscope. Of course, for all its targets, its explosions are invariably self-inflicted: it's your own heart, or else your mind, that sinks; the eye pops up to the surface. This, of course, owes to the local topography, to the streets—narrow, meandering like eels—that finally bring you to a flounder of a *campo* with a cathedral in the middle of it, barnacled with saints and flaunting its Medusa-like cupolas. No matter what you set out for as you leave the house here, you are bound to get lost in these

I drink for the thirst to come.

—François Rabelais, 1535

long, coiling lanes and passageways that beguile you to see them through, to follow them to their elusive end, which usually hits water, so that you can't even call it a cul-de-sac. On the map this city looks like two grilled fish sharing a plate, or perhaps like two nearly overlapping lobster claws (Pasternak compared it to a swollen croissant); but it has no north, south, east, or west; the only direction it has is sideways. It surrounds you like frozen seaweed, and the more you dart and dash about trying to get your bearings, the more you get lost. The yellow arrow signs at intersections are not much help either, for they, too, curve. In fact, they don't so much help you as kelp you. And in the fluently flapping hand of the native whom you stop to ask for directions, the eye, oblivious to his sputtering *A destra, a sinistra, dritto, dritto*, readily discerns a fish.

Joseph Brodsky, from *Watermark*. Expelled by Soviet authorities from his native city of Leningrad in 1972, the poet settled in the United States but spent extended periods of time in Europe. He had visited the city known as La Serenissima—"the Most Serene"—seventeen times before writing this homage. Asked why he liked Venice in winter, he responded, "It's like Greta Garbo swimming." Brodsky, who won the Nobel Prize in Literature in 1987, is buried in Venice's San Michele cemetery.

Dead Lakes

"Each lake," writes ecologist Brian Moss, "had a finite origin, has a history, and will eventually disappear. Millions already have gone; all existing ones are recording their history in sediment."



Aral Sea
Kazakhstan; Uzbekistan

How It Died

Diversion for irrigation

During the 1960s—when the Aral Sea is the world's fourth-largest body of inland water—the Soviet government diverts water from the Amu Darya and Syr Darya rivers to grow rice, melons, and cotton. By 2010, 84 percent of water taken from the watershed goes to irrigation; the lake is reduced to a tenth its 1960 size.



Lake Karachay
Chelyabinsk, Russia

How It Died

Radioactive waste

Between 1951 and 1953 the lake was the Mayak nuclear facility's primary dumping ground for radioactive waste. By 1990, a person standing on the shore for an hour would incur a fatal radiation dose of 600 roentgens.



Lake Victoria
Uganda; Kenya; Tanzania

How It Died

Invasive weeds

Water hyacinths start to grow wildly in 1989. Soon the plants cover 30,000 acres, preventing shipping and fishing. The suffocated lake experiences the greatest mass extinction of vertebrates in modern times. More than half its 500 fish species go extinct, including the ngege, once a dietary staple. Starting in 1996 *Neobetina* weevils are released into the lake and succeed in reducing the weed.



Lago Fucino
Cerchio, Italy

How It Died

Drainage

At one time this was the third-largest lake in Italy. In 1862 banking heir Alessandro Torlonia finances a canal to empty it. The former lake bed is now fertile farmland.



West Lake
Hangzhou, China

How It Died

Natural silting

Writer and statesman Su Shi dredges the lake in 1089, using mud to build an embankment across it. Periodic dredging must still be done to remove silt and mud. The lake—an inspiration for poets and painters—has disappeared several times.



Salton Sea
Salton City, California

How It Died

Natural evaporation and agricultural runoff

In 1905 engineers for the California Development Company dig irrigation canals from the Colorado River to Imperial Valley. The river overwhelms the canal, and for two years it flows into the Salton Trough. Levees eventually return the river to its previous course. Much of Salton's increasingly saline water has now evaporated, killing fish and birds; its dust clouds present a health threat.



Onondaga Lake
Syracuse, New York

How It Died

Industrial pollution

Soda ash is produced on the lakeshore starting in 1884; by the time the factory closes in 1986 it has dumped 6 million pounds of industrial waste in the lake, which is also contaminated with mercury and sewage. Swimming is banned in 1940, fishing in 1972. "In seven generations, that's still going to be a Superfund site," said one local in 2012.



Tulare Lake
Kings County, California

How It Died

Diversion for irrigation

The lake dries up by 1899; it occasionally reappears in wet years (including 1983 and 1997). It is used for seaplane landings in World War II.

1679: Nanking

DIFFERENT STROKES

Methods of Painting Waterfalls

Rocks form the bone structure of mountains, and waterfalls form the structure of rocks. Some say that water is by nature weak, so how can it be described as forming structure? I say: see how water strikes the mountain and pierces the rocks; it has supernatural strength, nothing is stronger. It was for this reason that Jiao Gong said that water is structural. Moreover, is not water, whether trickling, flowing, spraying, foaming, splashing, or in rivers or oceans, the very blood and marrow of heaven and earth? Blood nourishes the embryo, and the marrow nourishes the bones. Bones without marrow are dead bones. Such bones are like dry soil and can no longer be called bones. Mountains are bones, since water has formed them, and for this reason the ancients paid careful attention to painting waterfalls. They had the saying “Take five days to place water in a picture.”

Method of Painting a Waterfall Among Rocks

The waterfall flows among the layers of rocks. It should be painted so that one almost hears the sound of the water. The flow should be directed through the empty places among the rocks and in their hollows, over and among all the rocks.

Method of Painting an Overhanging Rock That Hides Part of the Waterfall

Wang Wei said, “When one is painting a waterfall, it should be so painted that there are interruptions but no breaks.” In this matter of “interruptions but no breaks,” the brush stops but the spirit [*chi*] continues; the appearance of the flow of water has a break, but the idea [*i*] of it is uninterrupted. It is like the divine dragon, whose body is partly hidden among the clouds but whose head and tail are naturally connected.

Method of Painting Billows

Mountains have strangely shaped peaks, and water also has strangely shaped peaks. Rocks are like great billows that roll and smash against mountains. When the moon is reflected on water, the waves are like galloping white horses, and at that moment one sees lofty mountains and peaks in their full grandeur. Wu Daoxuan painted pictures in which the whole night

One of the principal occupations of civilized man may be said to consist in making clean water dirty; and one of the greatest operations of nature is to make the dirty water clean and pure again.

—Edward Step, 1896

seemed filled with the sound of waters. He not only painted water beautifully but excelled in painting the wind. Zao Renxi, when he painted water, filled it with ten thousand currents without any effect of confusion. He was a master at painting calm waters as well as waves stirred by the wind.

Method of Painting the Rippling of Shallow Waters

In the painting of mountains, *ping yuan* [perspective on the level] should be observed. This is also true of painting water. When the wind subsides, waves and ripples calm down. When the clouds part, the moon emerges. The moonlit mists are vast and boundless, and the eye cannot see their limits. Rivers, seas, brooks, and ponds all in one moment may suddenly become cold, calm, and silent. Thus the nature of still waters may be revealed.

Wang Gai, from *The Mustard Seed Garden Manual of Painting*. A thirteen-volume work with sections devoted to painting orchids, bamboo, and chrysanthemums, this manual takes its name from the home of Li Yu, who wrote the foreword to the first edition. Under the pseudonym Lu Chai, Master of the Qing Zai Tang, Wang authored the work's first volume; his two brothers contributed text and artwork for the other books. The manual was immediately popular not only in China but also in Japan and Korea.

1986: Danube River

HISTORY LESSON

The real Danube is 650 feet in length, a minute tributary of the Brigach, though the official Danube starts a little further on, at the confluence of the Brigach, the Breg, and (strictly speaking) also the trickle of the Musel, a mere streamlet running down from Bad Dürkheim, that one can jump across. Moreover, ten or twenty miles downstream, at Immendingen, the Danube disappears, at least in part: it falls into fissures in the rocks and reemerges twenty-five miles further south, where it is called the Aach, and flows into Lake Constance and therefore into the Rhine (the sources of which are as disputed as those of the Danube). The Danube is therefore, in some measure, a tributary of the Rhine, flowing not into the Black Sea but into the North Sea—the triumph of the Rhine over the Danube, revenge of the Nibelungs over the Huns, predominance of Germany over Central Europe.

Ever since the *Song of the Nibelungs*, the Rhine and the Danube have confronted and challenged each other. The Rhine is Siegfried, symbol of Germanic *virtus* and purity, the loyalty of the Nibelungs, chivalric heroism, dauntless love of the destiny of the Germanic soul. The Danube is Pannonia, the kingdom of Attila, the eastern, Asiatic tide that at the end of the *Song of the Nibelungs* overwhelms Germanic values; when the Burgundians cross it on their way to the treacherous Hunnish court, their fate—a Germanic fate—is sealed.

The Danube is often enveloped in a symbolic anti-German aura. It is the river along which different peoples meet and mingle and crossbreed, rather than being, as the Rhine is, a mythical custodian of the purity of the race. It is the river of Vienna, Bratislava, Budapest, Belgrade, and of Dacia, the river that—as Ocean encircled the world of the Greeks—embraces the Austria of the Hapsburgs, the myth and ideology of which have been symbolized by a multiple, supranational culture. It embraces the

empire in which the sovereign addressed himself to “my peoples” and the national anthem was sung in eleven different tongues. The Danube is German-Magyar-Slavic-Romanic-Jewish Central Europe, polemically opposed to the Germanic Reich; it is a “hinternational” ecumene, for which in Prague Johannes Urzidil praised it; it is a hinterworld “behind the nations.”

The Danube-Aach version of the story appears, on the other hand, to be the symbol of that all-German ideology that viewed the multinational Hapsburg monarchy as a branch of Teutonic civilization, a stratagem or an instrument of Reason for the cultural Germanization of Central and Eastern Europe. Such a thesis was maintained, for example, by Heinrich von Srbik, the great Austrian historian who sang the praises of Prince Eugène of Savoy, was averse to Frederick the Great and Prussianism, and ended up a National Socialist.

This “hinternational” Central Europe, nowadays idealized as the harmony between different peoples, was without doubt a very real thing in the latter days of the Hapsburg Empire, a tolerant association of peoples understandably lamented when it was over, not least when compared with the totalitarian barbarism that replaced it in the lands of the Danube between the two World Wars. All the same, the Central European mission of the Hapsburgs was in some measure a makeshift ideology, arising from the failures of Austrian policy in Germany. The wars between Maria Theresa and Frederick II of Prussia severed what Heinrich von Srbik, in a book published in 1942, called *Deutsche Einheit*, German oneness. The split between Austria and Germany widened increasingly during the period that followed—from the Napoleonic Wars to the Austro-Prussian War of 1866, a period that witnessed the decline of Hapsburg power and above all of its leadership in Germany. Incapable of bringing about the unity of Germany, an ideal now headed by Prussia, the Austria of the Hapsburgs sought a new mission and a new identity in the supranational empire, the crucible of peoples and of cultures.



Photo Respiration from the Sea #333 Yura, by Tokihiro Sato, 1999. Archival pigment print.

At the root of the Hapsburg myth, which contrasts the Danube with the Rhine, there lies this historical wound, and as the wound grows worse, the myth grows more elaborate. During the First World War, at the beginning of the end, the writer Hugo von Hofmannsthal extolled “the Austrian,” praising his traditional ability to laugh at himself and his skeptical attitude toward history, and contrasting him with the state-worshipping Prussian, apostle of dialectical thought and virtuously fanatical. In the 1920s and 1930s, the identity crisis of the tiny, newborn Austrian Republic, orphan of the empire, stimulated and intensified categorical theory mongering about “Austrian-ness,” and dissertations on “The Austrian Man,” everlasting and utterly distinct from your German.

Austrian Fascism, in its attempt to stand up to Nazism, added to this tradition despite some profound inconsistencies. Refusal to be identified with the German element gives rise

to the Austrians’ constant talk about their own identity; the drift of this is that there is no such thing as an Austrian nationality, as Baron Andrian-Werburg asserted in the last century. Such introspection is ultimately concentrated into an endearing self-denigration, the discovery that “being Austrian” is something indefinable. Indeed, in this very factor they find their own essence—all the more gratifying for being anomalous.

Does the Danube lead further and further from the Rhine? Or else is it fated to appear as an emissary from those German waters to the east? The numerous political plans for Central Europe, put forward at various times, oscillate between schemes for multinational confederations, such as those of Franz or Popovici, and programs for German supremacy, such as those of Naumann. Writers almost always tend to see only the “hinternational” Danube, while historians also take account of the German-ness of



Mouth of the Cinquale, by Carlo Carrà, 1928.

Danubian Austria, with the Rheingold often gleaming in the blue Danube.

We have all been brought up to see the *Weltgeist* in terms of the big battalions, and we ought to learn from Johann Gottfried von Herder to understand it even where it is—or seems—still asleep or barely in its infancy. Maybe we shall never be really safe until we learn to feel, in an almost physical sense, that every nation is destined to have its day, and that there are not, in any absolute sense, greater or lesser civilizations but rather a succession of flowerings. Living and reading mean thinking about that “history of the human spirit” at all times and in all countries that Herder wanted to trace through the events of world literature, without sacrificing to any one single model the idea of the perennial universality of this spirit, but also without sacrificing any of the varied forms that have embodied it. He loved the perfection of Greek form, but this did not make him underestimate the song of the Latvian folk festival.

Like all the writers of the Sturm und Drang, Herder loved rivers, the youthful, im-

petuous torrents rushing downward with their fecund vitality. Looking now at this slender, newborn Danube, I wonder whether, as I follow it all the way to the delta, among different peoples and nations, I shall pass through an arena of bloody battles or else among the chorus of a human race united, despite everything, in the variety of its languages and its cultures. I wonder if what I have to expect is a string of battlefields, past, present, and future, or that “Danubian confederation” in the firm unity of which the great Hungarian aristocrat Count Károlyi never for one moment ceased to believe—not even when his faith in it forced him, as an exile in London, to sell his raincoat to pay his grocer’s bill.

Claudio Magris, *from Danube*. *A native of Trieste, Magris traveled the Danube from its source in the Black Forest to its outlet in the Black Sea to write this meditation on the unifying force of Europe’s second-longest river, which took him more than twenty years to complete. In 2012 Magris told an interviewer, “If I hadn’t studied already for many years German literature, Austrian literature, Mitteleuropean literature, I could not have chosen the Danube as a symbol for life and death and disappearance.”*

C. 4000 BC: Gulf of Carpentaria

LOCAL KNOWLEDGE

The ancestral serpent, a creature larger than storm clouds, came down from the stars, laden with its own creative enormity. It moved graciously—if you had been watching with the eyes of a bird hovering in the sky far above the ground. Looking down at the serpent's wet body, glistening from the ancient sunlight, long before man was a creature who could contemplate the next moment in time. It came down those billions of years ago, to crawl on its heavy belly, all around the wet clay soils in the Gulf of Carpentaria.

Picture the creative serpent, scoring deep into—scouring down through—the slippery underground of the mudflats, leaving in its wake the thunder of tunnels collapsing to form deep sunken valleys. The seawater following in the serpent's wake, swarming in a frenzy of tidal waves, soon changed color from ocean blue to the yellow of mud. The water filled the swirling tracks to form the mighty bending rivers spread across the vast plains of the gulf country. The serpent traveled over the marine plains, over the salt flats, through the salt dunes, past the mangrove forests and crawled inland. Then it went back to the sea. And it came out at another spot along the coastline and crawled inland and back again. When it finished creating the many rivers in its wake, it created one last river, no larger or smaller than the others, a river which offers no apologies for its discontent with people who do not know it. This is where the giant serpent continues to live deep down under the ground in a vast network of limestone aquifers. They say its being is porous; it permeates everything. It is all around in the atmosphere and is attached to the lives of the river people like skin.

This tidal river snake of slowing mud takes in breaths of a size that is difficult to comprehend. Imagine the serpent's breathing rhythms as the tide flows inland, edging toward the spring waters nestled deeply in the gorges of an ancient limestone plateau covered with rattling

grasses dried yellow from the prevailing winds. Then with the outward breath, the tide turns and the serpent flows back to its own circulating mass of shallow waters in the giant water basin in a crook of the mainland whose sides separate it from the open sea.

To catch this breath in the river, you need the patience of one who can spend days doing nothing. If you wait under the river gum where

Water has many ways of reminding us that when we are in it we are out of our element.

—Christopher Hitchens, 2008

those up-to-no-good mission-bred kids accidentally hanged Crybaby Sally, the tip of the dead branch points to where you will see how the serpent's breath fights its way through in a tunnel of wind, creating ripples that shimmer silver, similar to the scales of a small nocturnal serpent, thrashing in anger whenever the light hits its slippery translucent body, making it writhe and wrench to escape back into its natural environment of darkness.

The inside knowledge about this river and coastal region is the aboriginal law handed down through the ages since time began. Otherwise, how would one know where to look for the hidden underwater courses in the vast flooding mud plains, full of serpents and fish in the monsoon season? Can someone who did not grow up in a place that is sometimes underwater, sometimes bone-dry, know when the trade winds blowing off the southern and northern hemispheres will merge in summer? Know the moment of climatic change better than they know themselves? Who fishes in the yellow-colored monsoonal runoff from the drainages, with sheets of deep water pouring into the wide rivers swollen over their banks, filling vast plains with floodwaters? The cyclones linger and regroup, the rain never stops pouring, but the fat fish are abundant.

It takes a particular kind of knowledge to go with the river, whatever its mood. It is about there being no difference between you and the

movement of water as it seasonally shifts its tracks according to its own mood. A river that spurns human endeavor in one dramatic gesture, jilting a lover who has never really been known, as it did to the frontier town built on its banks in the hectic heyday of colonial vigor. A town intended to serve as a port for the shipping trade for the hinterland of northern Australia.

In one moment, during a wet season early in the last century, the town lost its harbor waters when the river simply decided to change course, to bypass it by several kilometers. Just like that. Now the waterless port survives with more or less nothing to do. Its citizens continue to engage in a dialogue with themselves passed down the generations, on why the town should continue to exist. They stayed on to safeguard the northern coastline from invasion by the Yellow Peril. A dreadful vision, a long yellow streak marching behind an arrowhead pointing straight for the little town of Desperance. Eventually the heat subsided. When the Yellow

Peril did not invade, everyone had a good look around and found a more contemporary reason for existence. It meant the town still had to be vigilant. Duty did not fall on one or two; duty was everybody's business. To keep a good eye out for whenever the moment presented itself, to give voice to a testimonial far beyond personal experience—to comment on the state of their blacks. To do so was regarded as an economic contribution to state rights, then, as an afterthought, to maintaining the decent society of the nation as a whole.

Alexis Wright, from *Carpentaria*. *Between ten thousand and eight thousand years ago, as sea levels rose and divided Australia from New Guinea, northern Australia was flooded, turning the area into a river-streaked marshland. Wright, a Waanyi writer and activist for indigenous rights, recalls this history as an aboriginal dreamtime story in the opening of her 2006 novel. Despite publishers repeatedly turning it down, the novel won the Miles Franklin Literary Award in 2007, making Wright the first indigenous Australian to be the sole recipient of the award.*

Bubble, by Sarah Anne Johnson, 2011. Chromogenic print, embossed and screen printed.



1977: Malibu, CA

JOAN DIDION GOES WITH THE FLOW

Some of us who live in arid parts of the world think about water with a reverence others might find excessive. The water I will draw tomorrow from my tap in Malibu is today crossing the Mojave Desert from the Colorado River, and I like to think about exactly where that water is. The water I will drink tonight in a restaurant in Hollywood is by now well down the Los Angeles Aqueduct from the Owens River, and I also think about exactly where that water is: I particularly like to imagine it as it cascades down the 45-degree stone steps that aerate Owens water after its airless passage through the mountain pipes and siphons. As it happens, my own reverence for water has always taken the form of this constant meditation upon where the water is, of an obsessive interest not in the politics of water but in the waterworks themselves, in the movement of water through aqueducts and siphons and pumps and forebays and afterbays and weirs and drains, in plumbing on the grand scale. I know the data on water projects I will never see. I know the difficulty Kaiser had closing the last two sluiceway gates on the Guri Dam in Venezuela. I keep watch on evaporation behind the Aswân in Egypt. I can put myself to sleep imagining the water dropping a thousand feet into the turbines at Churchill Falls in Labrador. If the Churchill Falls Project fails to materialize, I fall back on waterworks closer at hand—the tailrace at Hoover on the Colorado, the surge tank in the Tehachapi Mountains that receives California Aqueduct water pumped higher than water has ever been pumped before—and finally, I replay a morning when I was seventeen years old and caught, in a military-surplus life raft, in the construction of the Nimbus Afterbay Dam on the American River near Sacramento. I remember that at the moment it happened I was trying to open a tin of anchovies with capers. I recall the raft spinning into the narrow chute through which the river had been temporarily diverted. I recall being deliriously happy.

I suppose it was partly the memory of that delirium that led me to visit, one summer morning in Sacramento, the Operations Control Center for the California State Water Project. Actually, so much water is moved around California by so many different agencies that maybe only the movers themselves know on any given day whose water is where, but to get a general picture it is necessary only to remember that Los Angeles moves some of it, San Francisco moves some of it, the Bureau of Reclamation's Central Valley Project moves some of it, and the California State Water Project moves most of the rest of it, moves a vast amount of it, moves more water farther than has ever been moved anywhere. They collect this water up in the granite keeps

Too often, where we need water we find guns.

—*Ban Ki-moon, 2008*

of the Sierra Nevada, and they store roughly a trillion gallons of it behind the Oroville Dam, and every morning, down at the project's headquarters in Sacramento, they decide how much of their water they want to move the next day. They make this morning decision according to supply and demand, which is simple in theory but rather more complicated in practice. In theory, each of the project's five field divisions—the Oroville, the Delta, the San Luis, the San Joaquin, and the Southern divisions—places a call to headquarters before nine AM and tells the dispatchers how much water is needed by its local water contractors, who have in turn based their morning estimates on orders from growers and other big users. A schedule is made. The gates open and close according to schedule. The water flows south and the deliveries are made.

In practice, this requires prodigious coordination, precision, and the best efforts of several human minds and that of a Univac 418. In practice, it might be necessary to hold large flows of water for power production, or to flush out encroaching salinity in the Sacramento–San Joaquin Delta, the most ecologically sensitive point on the system. In practice, a sudden rain might



Folding screen from the series *Landscape of the Four Seasons (Eight Views of the Xiao and Xiang Rivers)*, by Soami, early sixteenth century.

obviate the need for a delivery when that delivery is already on its way. In practice, what is being delivered here is an enormous volume of water, not quarts of milk or spools of thread, and it takes two days to move such a delivery down through Oroville into the Delta, which is the great pooling place for California water and has been for some years alive with electronic sensors and telemetering equipment and men blocking channels and diverting flows and shoveling fish away from the pumps. It takes perhaps another six days to move this same water down the California Aqueduct from the Delta to the Tehachapi and put it over the hill to Southern California. “Putting some over the hill” is what they say around the Project Operations Control Center when they want to indicate that they are pumping Aqueduct water from the floor of the San Joaquin Valley up and over the Tehachapi Mountains. “Pulling it down” is what they say when they want to indicate that they are lowering a water level somewhere in the system. They can put some over the hill by remote control from this room in Sacramento with its Univac and its big board and its flashing lights. They can pull down a pool in the San Joaquin by remote control from this room in Sacramento with its locked doors and its ringing alarms and its constant printouts of data from sensors out there in the water itself. From this room in Sacramento, the whole system takes on the aspect of a perfect \$3 bil-

lion hydraulic toy, and in certain ways it is. “Let’s start draining quail at 12:00” was the 10:51 AM entry on the electronically recorded communications log the day I visited the Operations Control Center. “Quail” is a reservoir in Los Angeles County with a gross capacity of 1,636,018,000 gallons. “OK” was the response recorded in the log. I knew at that moment that I had missed the only vocation for which I had any instinctive affinity: I wanted to drain Quail myself.

Not many people I know carry their end of the conversation when I want to talk about water deliveries, even when I stress that these deliveries affect their lives, indirectly, every day. “Indirectly” is not quite enough for most people I know. This morning, however, several people I know were affected not “indirectly” but “directly” by the way water moves. They had been in New Mexico shooting a picture, one sequence of which required a river deep enough to sink a truck, the kind with a cab and a trailer and fifty or sixty wheels. It so happened that no river near the New Mexico location was running that deep this year. The production was therefore moved today to Needles, California, where the Colorado River normally runs, depending upon releases from Davis Dam, eighteen to twenty-five feet deep. Now. Follow this closely: yesterday we had a freak tropical storm in Southern California, two inches of rain in a normally dry

month, and because this rain flooded the fields and provided more irrigation than any grower could possibly want for several days, no water was ordered from Davis Dam.

No orders, no releases.

Supply and demand.

As a result, the Colorado was running only seven feet deep past Needles today, Sam Peckinpah's desire for eighteen feet of water in which to sink a truck not being the kind of demand anyone at Davis Dam is geared to meet. The production closed down for the weekend. Shooting will resume Tuesday, providing some grower orders water and the agencies controlling the Colorado release it. Meanwhile, many gaffers, best boys, cameramen, assistant directors, script supervisors, stunt drivers, and maybe even Sam Peckinpah are waiting out the weekend in Needles, where it is often 110 degrees at five PM and hard to get dinner after eight. This is a California parable, but a true one.

I have always wanted a swimming pool, and never had one. When it became generally known a year or so ago that California was suffering severe drought, many people in water-rich parts of the country seemed obscurely gratified, and made frequent reference to Californians having to brick up their swimming pools. In fact, a swimming pool requires, once it has been filled and the filter has begun its process of cleaning and recirculating the water, virtually no water, but the symbolic content of swimming pools has always been interesting: a pool is misapprehended as a trapping of affluence, real or pretended, and of a kind of hedonistic attention to the body. Actually, a pool is, for many of us in the West, a symbol not of affluence but of order, of control over the uncontrollable. A pool is water, made available and useful, and is, as such, infinitely soothing to the Western eye.

It is easy to forget that the only natural force over which we have any control out here is water, and that only recently. In my memory California summers were characterized by the coughing in the pipes that meant the well was dry, and California winters by all-night watches

1625: London

FOUNTAINHEAD

Fountains are a great beauty and refreshment; but pools mar all and make a garden unwholesome and full of flies and frogs. Fountains I intend to be of two natures: the one, that sprinkleth or spouteth water; the other, a fair receipt of water of some thirty or forty foot square, but without fish or slime or mud. For the first, the ornaments of images gilt, or of marble, which are in use, do well; but the main matter is so to convey the water, as it never stay either in the bowls or in the cistern, that the water be never by rest discolored, green, or red or the like, or gather any mossiness or putrefaction. Besides that, it is to be cleansed every day by the hand. Also, some steps up to it, and some fine pavement about it, doth well. As for the other kind of fountain, which we may call a bathing pool, it may admit much curiosity and beauty, wherewith we will not trouble ourselves, as that the bottom be finely paved, and with images, the sides likewise, and withal embellished with colored glass and such things of luster, encompassed also with fine rails of low statues. But the main point is the same, which we mentioned in the former kind of fountain, which is that the water be in perpetual motion, fed by a water higher than the pool and delivered into it by fair spouts, and then discharged away underground, by some equality of bores, that it stay a little. And for fine devices of arching water without spilling and making it rise in several forms (of feathers, drinking glasses, canopies, and the like), they be pretty things to look on but nothing to health and sweetness.

Francis Bacon, from "Of Gardens." "God Almighty first planted a garden," reads the opening line of Bacon's essay, which reveals both his devout Protestantism and his spiritual devotion to gardens, where the "breath of flowers" can be enjoyed. In 1576 Bacon moved to France to serve the English ambassador. In between his menial daily duties, Bacon examined the palatial gardens in Paris and the Loire Valley, later designing gardens for his many residences, including his two country estates in Twickenham and Gorbamby.

on rivers about to crest, by sandbagging, by dynamite on the levees and flooding on the first floor. Even now the place is not all that hospitable to extensive settlement. As I write, a fire has been burning out of control for two weeks

in the ranges behind the Big Sur coast. Flash floods last night wiped out all major roads into Imperial County. I noticed this morning a hair-line crack in a living-room tile from last week's earthquake, a 4.4 I never felt. In the part of California where I now live, aridity is the single most prominent feature of the climate, and I am not pleased to see, this year, cactus spreading wild to the sea. There will be days this winter when the humidity will drop to ten, seven, four. Tumbleweed will blow against my house, and the sound of the rattlesnake will be duplicated a hundred times a day by dried bougainvillea drifting in my driveway. The apparent ease of California life is an illusion, and those who believe the illusion real live here in only the most temporary way. I know as well as the next person that there is considerable transcendent value in a river running wild and undammed, a river running free over granite, but I have also lived beneath such a river when it was running in flood, and gone without showers when it was running dry.

"The West begins," Bernard DeVoto wrote, "where the average annual rainfall drops below twenty inches." This is maybe the best definition of the West I have ever read, and it goes a long way toward explaining my own passion for seeing the water under control, but many people I know persist in looking for psychoanalytical implications in this passion. As a matter of fact, I have explored, in an amateur way, the more obvious of these implications, and come up with nothing interesting. A certain external reality remains, and resists interpretation. The West begins where the average annual rainfall drops below twenty inches. Water is important to people who do not have it, and the same is true of control. Some fifteen years ago I tore a poem by Karl Shapiro from a magazine and pinned it on my kitchen wall. This fragment of paper is now on the wall of a sixth kitchen, and crumbles a little whenever I touch it, but I keep it there for the last stanza, which has for me the power of a prayer:

It is raining in California, a straight rain
Cleaning the heavy oranges on the bough,

Filling the gardens till the gardens flow,
Shining the olives, tiling the gleaming tile,
Waxing the dark camellia leaves more green,
Flooding the daylong valleys like the Nile.

I thought of those lines almost constantly on the morning in Sacramento when I went to visit the California State Water Project Operations Control Center. If I had wanted to drain Quail at 10:51 that morning, I wanted, by early afternoon, to do a great deal more. I wanted to open and close the Clifton Court Forebay intake gate. I wanted to produce some power down at the San Luis Dam. I wanted to pick a pool at random on the Aqueduct and pull it down and then refill it, watching for the hydraulic jump. I wanted to put some water over the hill, and I wanted to shut down all flow from the Aqueduct into the Bureau of Reclamation's Cross Valley Canal, just to see how long it would take somebody over at Reclamation to call up and complain. I stayed as long as I could and watched the system work on the big board with the lit checkpoints. The Delta salinity report was coming in on one of the teletypes behind me. The Delta tidal report was coming in on another. The earthquake board, which has been desensitized to sound its alarm (a beeping tone for Southern California, a high-pitched tone for the north) only for those earthquakes that register at least 3.0 on the Richter scale, was silent. I had no further business in this room, and yet I wanted to stay the day. I wanted to be the one, that day, who was shining the olives, filling the gardens, and flooding the daylong valleys like the Nile. I want it still.

"Holy Water." A fifth-generation Californian born in Sacramento, Didion included this essay in 'The White Album.' "I'm not interested in the middle road," she told the New York Times in 1979, shortly before the book's release. "I think it comes out of being a 'daughter of the Golden West.' A lot of the stories I was brought up on had to do with extreme actions—leaving everything behind, crossing the trackless wastes, and in those stories the people who stayed behind and had their settled ways—those people were not the people who got the prize. The prize was California."



Sea Dance 3, from the series *Sea Women*, by Zena Holloway, 2016.

1989: Simmesport, LA

AGAINST NATURE

The Mississippi River, with its sand and silt, has created most of Louisiana, and it could not have done so by remaining in one channel. If it had, southern Louisiana would be a long, narrow peninsula reaching into the Gulf of Mexico. Southern Louisiana exists in its present form because the Mississippi River has jumped here and there within an arc about two hundred miles wide, like a pianist playing with one hand—frequently and radically changing course, surging over the left or the right bank to go off in utterly new directions. Always it is the river's purpose to get to the gulf by the shortest and steepest gradient. As the mouth advances southward and the river length-

ens, the gradient declines, the current slows, and sediment builds up the bed. Eventually, it builds up so much that the river spills to one side. Major shifts of that nature have tended to occur roughly once a millennium. The Mississippi's main channel of three thousand years ago is now the quiet water of Bayou Teche, which mimics the shape of the Mississippi. Along Bayou Teche, on the high ground of ancient natural levees, are Jeanerette, Breaux Bridge, Broussard, Olivier—arcuate strings of Cajun towns. Eight hundred years before the birth of Christ, the channel was captured from the east. It shifted abruptly and flowed in that direction for about a thousand years. In the second century, it was captured again and taken south by the now unprepossessing Bayou Lafourche, which, by the year 1000, was losing its hegemony to the river's present course, through



Mechanic's Rock, Low Water (detail), by Henry P. Bosse, 1889.

the region that would be known as Plaquemines. By the 1950s the Mississippi River had advanced so far past New Orleans and out into the gulf that it was about to shift again, and its offspring Atchafalaya was ready to receive it. By the route of the Atchafalaya, the distance across the delta plain was 145 miles—well under half the length of the route of the master stream.

For the Mississippi to make such a change was completely natural, but in the interval since the last shift, Europeans had settled beside the river, a nation had developed, and the nation could not afford nature. The consequences of the Atchafalaya's conquest of the Mississippi would include but not be limited to the demise of Baton Rouge and the virtual destruction of New Orleans. With its fresh water gone, its harbor a silt bar, its economy disconnected from inland commerce, New Orleans would turn into New Gomorrah. Moreover, there were so many big industries between the two cities that at night they made the river glow like a worm. As a result of settlement patterns, this reach of the Mississippi had long been known as "the German coast," and now, with B.F. Goodrich, E.I. du Pont, Union Carbide, Reynolds Metals, Shell, Mobil, Texaco, Exxon, Monsanto, Uniroyal, Georgia-Pacific, Hydrocarbon Industries, Vulcan Mate-

rials, Nalco Chemical, Freeport Chemical, Dow Chemical, Allied Chemical, Stauffer Chemical, Hooker Chemicals, Rubicon Chemicals, American Petrofina—with an infrastructural concentration equaled in few other places—it was often called "the American Ruhr." The industries were there because of the river. They had come for its navigational convenience and its fresh water. They would not, and could not, linger beside a tidal creek. For nature to take its course was simply unthinkable. The Sixth World War would do less damage to southern Louisiana. Nature, in this place, had become an enemy of the state.

Norris Rabalais works for the U.S. Army Corps of Engineers. Some years ago the corps made a film that showed the navigation lock and a complex of associated structures built in an effort to prevent the capture of the Mississippi. The narrator said, "This nation has a large and powerful adversary. Our opponent could cause the United States to lose nearly all her seaborne commerce, to lose her standing as first among trading nations... We are fighting Mother Nature... It's a battle we have to fight day by day, year by year; the health of our economy depends on victory."

Rabalais was in on the action from the beginning, working as a construction inspector. Here by the site of the navigation lock was where

the battle had begun. An old meander bend of the Mississippi was the conduit through which water had been escaping into the Atchafalaya. Complicating the scene, the old meander bend had also served as the mouth of the Red River. Coming in from the northwest, from Texas via Shreveport, the Red River had been a tributary of the Mississippi for a couple of thousand years—until the 1940s, when the Atchafalaya captured it and drew it away. The capture of the Red increased the Atchafalaya's power as it cut down the country beside the Mississippi. On a map, these entangling watercourses had come to look like the letter H. The Mississippi was the right-hand side. The Atchafalaya and the captured Red were the left-hand side. The crosspiece, scarcely seven miles long, was the former meander bend, which the people of the parish had long since named Old River. Sometimes enough water would pour out of the Mississippi and through Old River to quintuple the falls at Niagara. It was at Old River that the United States was going to lose its status among the world's trading nations. It was at Old River that New Orleans would be lost, Baton Rouge would be lost. At Old River, we would lose the American Ruhr. The army's name for its operation there was Old River Control.

Rabalais gestured across the lock toward what seemed to be a pair of placid lakes separated by a trapezoidal earth dam a hundred feet high. It weighed five million tons, and it had stopped Old River. It had cut Old River in two. The severed ends were sitting there filling up with weeds. Where the Atchafalaya had entrapped the Mississippi, bigmouth bass were now in charge. The navigation lock had been dug beside this monument. The big dam, like the lock, was fitted into the mainline levee of the Mississippi. In Rabalais' pickup, we drove on the top of the dam and drifted as well through Old River country. On this day, he said, the water on the Mississippi side was eighteen feet above sea level, while the water on the Atchafalaya side was five feet above sea level. Cattle were grazing on the slopes of the levees, and white horses with white colts, in deep-green grass. Behind the levees, the fields were flat and reached to rows of

distant trees. Very early in the morning, a low fog had covered the fields. The sun, just above the horizon, was large and ruddy in the mist, rising slowly, like a hot-air balloon. This was a countryside of corn and soybeans, of grain-fed-catfish ponds, of feed stores and Kingdom Halls in crossroad towns. There were small, neat cemeteries with ranks of white sarcophagi raised a foot or two aboveground, notwithstanding the protection of the levees. There were tar-papered cabins on concrete pylons, and low brick houses under planted pines. Pickups under the pines. If this was a form of battlefield, it was not unlike a great many battlefields—landscapes so quiet they belie their story. Most battlefields, though, are places where something happened once. Here it would happen indefinitely.

We went out to the Mississippi. Still indistinct in mist, it looked like a piece of the sea. Rabalais said, "That's a wide booger, right there." In the spring high water of vintage years—1927, 1937, 1973—more than two million cubic feet of water had gone by this place in every second. Sixty-five kilotons per second. By the mouth of the inflow channel leading to the lock were rock jetties, articulated concrete mattress revetments, and other heavy defenses. Rabalais observed that this particular site was no more vulnerable than almost any other point in this reach of river that ran so close to the Atchafalaya plain. There were countless places where a breakout might occur: "It has a tendency to go through just anywheres you can call for."

Why, then, had the Mississippi not jumped the bank and long since diverted to the Atchafalaya?

"Because they're watching it close," said Rabalais. "It's under close surveillance."

John McPhee, from *Atchafalaya*. "In 1963 McPhee wrote his first story for *The New Yorker*, about his time as a Cambridge University basketball player; he remains a staff writer for the magazine. In a 2010 interview with *The Paris Review*, he discussed the difficulties a writer faces in pursuing a career. "There is no path," he said. "If you go to dental school, you're a dentist when you're done. For the young writer, it's like seeing islands in a river and there's all this stuff you can get into—where do you go?"

c. 1850: Dawnland

RESOURCE WAR

Glooscap yet lives, somewhere at the southern edge of the world. He never grows old, and he will last as long as this world lasts. Sometimes Glooscap gets tired of running the world, ruling the animals, regulating nature, instructing people how to live. Then he tells us, "I'm tired of it. Goodbye. I'm going to make myself die now." He paddles off in his magic white canoe and disappears in misty clouds. But he always comes back. He cannot abandon the people forever, and they cannot live without him.

Glooscap is a spirit, a medicine man, a sorcerer. He can make men and women smile. He can do anything.

Glooscap created a village and taught the people there everything they needed to know. They were happy hunting and fishing. Men and women were happy making love. Children were happy playing. Parents cherished their children, and children respected their parents. All was well as Glooscap had made it.

The village had one spring, the only source of water far and wide, that always flowed with pure, clear, cold water. But one day the spring ran dry; only a little bit of slimy ooze issued from it. It stayed dry even in the fall when the rains came, and in the spring when the snows melted. The people wondered, "What shall we do? We can't live without water." The wise men and elders held a council and decided to send a man north to the source of the spring to see why it had run dry.

This man walked a long time until at last he came to a village. The people there were not like humans; they had webbed hands and feet. Here the brook widened out. There was some water in it, not much, but a little, though it was slimy, yellowish, and stinking. The man was thirsty from his walk and asked to be given a little water, even if it was bad.

"We can't give you any water," said the people with the webbed hands and feet, "unless our great chief permits it. He wants all the water for himself."

"Where is your chief?" asked the man.

"You must follow the brook farther up," they told him.

The man walked on and at last met the big chief. When he saw him, he trembled with fright because the chief was a monster so huge that if one stood at his feet, one could not see his head. The monster filled the whole valley from end to end. He had dug himself a huge hole and dammed it up so that all the water was in it and none could flow into the streambed. And he had fouled the water and made it poisonous so that stinking mists covered its slimy surface.

The monster had a mile-wide, grinning mouth going from ear to ear. His dull yellow eyes started out of his head like huge pine knots. His body was bloated and covered with warts as big as mountains. The monster stared dully at the man with his protruding eyes and finally said in a fearsome croak, "Little man, what do you want?"

The man was terrified, but he said, "I come from a village far downstream. Our only spring ran dry because you're keeping all the water for yourself. We would like you to let us have some of this water. Also, please don't muddy it so much."

The monster blinked at him a few times. Finally he croaked:

Do as you please,
Do as you please,
I don't care,
I don't care.
If you want water,
If you want water,
Go elsewhere!

The man said, "We need the water. The people are dying of thirst." The monster replied,

I don't care,
I don't care,
Don't bother me,
Don't bother me,
Go away,
Go away,
Or I'll swallow you up!



Fountain of Youth (detail), miniature from De Sphaera, fifteenth century.

The monster opened his mouth wide from ear to ear, and inside it the man could see the many things that the creature had killed. The monster gulped a few times and smacked his lips with a noise like thunder. At this the man's courage broke, and he turned and ran away as fast as he could.

Back at his village, the man told the people, "Nothing can be done. If we complain, this monster will swallow us up. He'll kill us all."

The people were in despair. "What shall we do?" they cried. Now, Glooscap knows everything that goes on in the world, even before it happens. He sees everything with his inward eye. He said, "I must set things right. I'll have to get water for the people!"

Then Glooscap girded himself for war. He painted his body with paint as red as blood. He made himself twelve feet tall. He used two huge clamshells for his earrings. He put a hundred black eagle feathers and a hundred white eagle feathers in his scalp lock. He painted

yellow rings around his eyes. He twisted his mouth into a snarl and made himself look ferocious. He stamped, and the earth trembled. He uttered his fearful war cry, and it echoed and reechoed from all the mountains. He grasped a huge mountain in his hand, a mountain composed of flint, and from it made himself a single knife, sharp as a weasel's teeth. "Now I am going," he said, striding forth among thunder and lightning, with mighty eagles circling above him. Thus Glooscap came to the village of the people with webbed hands and feet.

"I want water," he told them. Looking at him, they were afraid. They brought him a little muddy water. "I think I'll get more and cleaner water," he said. Glooscap went upstream and confronted the monster. "I want clean water," he said, "a lot of it, for the people downstream."

Ho! Ho!

Ho! Ho!

All the waters are mine!



Mangrove I, by Richard Mosse, 2014. Digital chromogenic print.

All the waters are mine!
Go away!
Go away!
Or I'll kill you!

"Slimy lump of mud!" cried Glooscap. "We'll see who will be killed!" They fought. The mountains shook. The earth split open. The swamp smoked and burst into flames. Mighty trees were shivered into splinters.

The monster opened its huge mouth wide to swallow Glooscap. Glooscap made himself taller than the tallest tree, and even the monster's mile-wide mouth was too small for him. Glooscap seized his great flint knife and slit the monster's bloated belly. From the wound gushed a mighty stream, a roaring river, tumbling, rolling, foaming down, down, down, gouging out for itself a vast, deep bed,

flowing by the village and on to the great sea of the east.

"That should be enough water for the people," said Glooscap. He grasped the monster and squeezed him in his mighty palm, squeezed and squeezed and threw him away, flinging him into the swamp. Glooscap had squeezed this great creature into a small bullfrog, and ever since, the bullfrog's skin has been wrinkled because Glooscap squeezed so hard.

An Abenaki legend. The character of Glooscap appears in the mythology of many Eastern Algonquian-speaking indigenous nations, who for as many as three thousand years inhabited land that is now part of the northeastern United States and Canada's Atlantic provinces. A benevolent trickster-hero who transforms nature, Glooscap makes the world more hospitable to human beings. According to one Mi'kmaq legend, he is a creator-giant who built Nova Scotia as his bed and Prince Edward Island as his pillow.

2005: Bois Sauvage, MS

STORM WARNING

When Mama first explained to me what a hurricane was, I thought that all the animals ran away, that they fled the storms before they came, that they put their noses to the wind days before and knew. That maybe they stuck their tongues out, pink and warm, to taste, to make sure. That the deer looked at their companions and leaped. That the foxes chattered to themselves, rolled their shoulders, and started off. And maybe the bigger animals do. But now I think that other animals, like the squirrels and the rabbits, don't do that at all. Maybe the small don't run. Maybe the small pause on their branches, the pine-lined earth, nose up, catch that coming storm air that would smell like salt to them, like salt and clean-burning fire, and they prepare like us. The squirrels pack feathers, pack pine straw, pack shed fur and acorns from the oaks in the bowels of their trees, line them so that they are buried deep in the trunks, so safe they can hardly hear the storm cracking around them. The rabbits stand in profile, shank to shank, smell that storm smell that hits them all at once like a loud sound, and they tunnel down through the red clay and the sand, down until the earth turns black and cold, down past all the roots, until they have dug great halls so deep that they sit right above the underground reservoirs we tap into with our wells, and during the hurricane, they hear water lapping above and below while they sit safe in the hand of the earth.

Last night, we laid sleeping pallets in the living room, whose windows we'd lined with mismatched wood. Randall and I, side by side, on the floor, and Junior on the couch. We brought our own limp pillows, our flat and fitted sheets, and our old electric blankets short-circuited cold long ago. We piled them to create mattresses so flimsy we could feel the nubby carpet on the floor underneath us when we sat. We washed all the dishes. We filled the bathtub, the kitchen and the bathroom sinks to the

brims with water that we could use for washing and flushing the toilet.

Before I fell asleep, in the flickering light from the television and one dusty lamp, I read. In ancient Greece, for all her heroes, for Medea and her mutilated brother and her devastated father, water meant death. In the bathroom on the toilet, I heard the clanking of metal against metal outside, some broken machine tilting like a sinking headstone against another, and I knew it was the wind pushing a heavy rain.

On the day before a hurricane hits, the phone rings. When Mama was living, she picked it up; it is a phone call from the state government that goes out to everyone in the

I ride rough waters and shall sink with no one to save me.

—Virginia Woolf, 1931

area who will be hit by a storm. Randall has answered it since we lost Mama; he lets it play at least once each summer. Skeetah answered once and hung up before the recording could get beyond the *hello*. Junior never has picked it up, and neither has Daddy. I picked it up for the first time yesterday. A man's voice speaks; he sounds like a computer, like he has an iron throat. I cannot remember exactly what he says, but I remember it in general. *Mandatory evacuation. Hurricane making landfall tomorrow. If you choose to stay in your home and have not evacuated by this time, we are not responsible. You have been warned. And these could be the consequences of your actions.* There is a list. And I do not know if he says this, but this is what it feels like: *You can die.*

This is when the hurricane becomes real.

The first hurricane that I remember happened when I was eight, and of the two or three we get every year, it was the worst I've ever been in. Mama let me kneel next to the chair she'd dragged next to the window. Even then, our boards were mismatched, and there were gaps we could peer out of, track the progress of the storm in the dark. The battery-operated radio

1850: Nile River

UPSTREAM COLOR

We left Old Cairo with a good north wind. Our two sails, their angles intersecting, swelled to their entire width, and the *cange* skimmed along, heeling, its keel cutting the water. Sitting cross-legged in the bow, our Rais Ibrahim stared ahead, and from time to time, without turning around, called back an order to the crew. Standing on the poop that forms the roof of our cabin, the mate held the tiller, smoking his black wooden chibouk. The sun was bright, the sky blue. With our glass we saw herons and storks here and there on the banks.

The water of the Nile is quite yellow; it carries a good deal of soil. One might think of it as being weary of all the countries it has crossed, weary of endlessly murmuring the same monotonous complaint that it has traveled too far. If the Niger and the Nile are but one and the same river, where does this water come from? What has it seen? Like the ocean, this river sends our thoughts back almost incalculable distances; then there is the eternal dream of Cleopatra, and the great memory of the sun, the golden sun of the pharaohs. As evening fell, the sky turned all red to the right, all pink to the left. The pyramids of Saqqâra stood out sharp and gray against the vermilion backdrop of the horizon. An incandescence glowed in all that part of the sky, drenching it with a golden light. On the other bank, to the left, everything was pink; the closer to the earth, the deeper the pink. The pink lifted and paled, becoming yellow, then greenish; then the green itself paled, and almost imperceptibly, through white, became the blue that made the vault above our heads, where there was the final melting of the transition (abrupt) between the two great colors.

Dance of the sailors. Joseph at his stoves. The boat heeling. The Nile in the middle of the landscape; and we in the middle of the Nile.

Gustave Flaubert, from his travel notes. *Napoleon's Egyptian campaign set off a mania for orientalism in France; as a young man, Flaubert joined in this bourgeois enthusiasm. At age eleven, he had seen a boat in Rouen's port carrying an Egyptian obelisk destined for Paris' Place de la Concorde. Sixteen years later he left Paris for Cairo, spending several weeks sailing up the Nile, finally arriving in Karnak. He returned to France in 1851 and published the first installment of Madame Bovary in 1856.*

told us nothing practical, but the yard did: the trees bending until almost breaking, arcing like fishing line, empty oil drums rattling across the yard, the water running in clear streams, carving canyons. Her stomach was big with Junior, and I laid a hand on it and watched. Junior was a surprise, a happy accident; she'd had me and Skeetah and Randall a year apart each, and then nothing else for nine years. I kneeled next to her and put my ear to her stomach and heard the watery swish of Junior inside her, as outside the wind pulled, branch by root, until it uprooted a tree ten feet from the house. Mama watched with her eye to the slit formed by the board over the window. She rocked from side to side like the baby in her would not let her sit still. She stroked my hair.

That storm, Elaine, had been a category three. Katrina, as the newscaster said late last night after we settled in the living room, echoing Daddy, has reached a category five.

During Elaine, Randall and Daddy had slept. Skeetah had sat on the other side of Mama, opposite me, and she'd told us about the big storm when she was little, the legend: Camille. She said Mother Lizbeth and Papa Joseph's roof was ripped off the house. She said the smell afterward was what she remembered most clearly, a smell like garbage set to rot, seething with maggots in the hot sun. She said the newly dead and the old dead littered the beaches, the streets, the woods. She said Papa Joseph found a skeleton in the yard, gleaming, washed clean of flesh and clothing, but she said it still stank like a bad tooth in the mouth. She said that Papa Joseph never took the remains down to the church, but carried it in an oyster sack out into the woods; she thought he buried the bones there. She said she and Mother Lizbeth walked miles for water from an artesian well. She said she got sick, and most everybody did, because even then the water wasn't clean, and she had dreamed that she could never get away from water because she couldn't stop shitting it or pissing it or throwing it up. She said there would never be another like Camille, and if there was, she didn't want to see it.

Water in the Quran

Water is a central theme of the Quran, which promises pious believers an afterlife with “gardens graced with flowing streams” and “rivers of water forever pure,” while those who reject the book’s teachings are condemned to eternal fire and showered with “water like molten metal, scalding their faces” in punishment. “To a desert culture,” writes historian Garry Wills, “water is not only needed for life. It is life. It is the material thing nearest to God.” Below are five illustrative verses from the Quran’s suras translated by Muhammad A.S. Abdel Haleem.

WATER AS CREATION

Are the disbelievers not aware that the heavens and the earth used to be joined together and that God ripped them apart, that He made every living thing from water?

—from *The Prophets* (21:30)

WATER AS DRINK AND SUSTENANCE

It is He who sends down water for you from the sky, from which comes a drink for you, and the shrubs that you feed to your animals. With it He grows for you grain, olives, palms, vines, and all kinds of other crops. There truly is a sign in this for those who reflect...It is He who made the sea of benefit to you: you eat fresh fish from it and bring out jewelry to wear; you see the ships cutting through its waves so that you may go in search of His bounty and give thanks. Can He who creates be compared to one who cannot create? Why do you not take heed?

—from *The Bee* (16:10–16)

WATER AS LIFE FORCE

He brings the living out of the dead and the dead out of the living. He gives life to the earth after death, and you will be brought out the same way. One of His signs is that He created

you from dust and—lo and behold!—you became human and scattered far and wide. He sends water down from the sky to restore the earth to life after death. There truly are signs in this for those who use their reason.

—from *The Byzantines* (30:19–24)

WATER AS GIFT

He sends water from the sky that fills riverbeds to overflowing, each according to its measure. The stream carries on its surface a growing layer of froth, like the froth that appears when people melt metals in the fire to make ornaments and tools: in this way God illustrates truth and falsehood—the froth disappears, but what is of benefit to man stays behind—this is how God makes illustrations.

—from *Thunder* (13:17)

FRESH WATER SEPARATED FROM SALT WATER

Who is it that made the earth a stable place to live? Who made rivers flow through it? Who set immovable mountains on it and created a barrier between the fresh and salt water? Is it another god beside God? No! But most of them do not know.

—from *The Ants* (27:60–61)

I fell asleep after everyone else did last night, and now I wake before everyone. The TV is dead. The house is quiet in a way it never is, its electric hum silent; in our sleep, the arriving storm has put a strangling hand over the house. We’ve lost power. Through the crack in the living room window, the morning is dark gray and opaque as dirty dishwater. The rain clatters on the rusted tin roof. And the wind, which yesterday only made itself known by sight, sighs and says, *Hello*. I lay here in the dark, pull my thin sheet up to my neck, stare at the ceiling, and do not answer.

It is terrible. It is the flailing wind that lashes like an extension cord used as a beating belt. It is the rain, which stings like stones, which drives into our eyes and bids them shut. It is the water, swirling and gathering and spreading on all sides, brown with an undercurrent of

red to it, the clay of the Pit like a cut that won’t stop leaking. It is the remains of the yard, the refrigerators and lawn mowers and the RV and mattresses, floating like a fleet. It is trees and branches breaking, popping like Black Cat firecrackers in an endless crackle of explosions, over and over and again and again. It is us huddling together on the roof, me with the wire of the bucket handle looped over my shoulder, shaking against the plastic. It is everywhere.

Jesmyn Ward, from *Salvage the Bones*. Ward, who received the 2011 National Book Award for this novel, still lives in DeLisle, Mississippi, a town of about a thousand people on the Gulf Coast, where she was born in 1977. The town—which inspired *Bois Sauvage*, the setting for Ward’s fiction—was ravaged by Hurricane Katrina. Ward witnessed it firsthand. “I looked down at my feet,” she later told PBS, “and the water was filling up my footprints as I’m walking along on this carpet.”

1957: Platte River

THE ORGANIZING MYSTERY

Every spring in the wet meadows and ditches I hear a little shrilling chorus which sounds for all the world like an endlessly reiterated “We’re here, we’re here, we’re here.” And so they are, as frogs, of course. Confident little fellows. I suspect that to some greater ear than ours, man’s optimistic pronouncements about his role and destiny may make a similar little ringing sound that travels a small way out into the night. It is only its nearness that is offensive. From the heights of a mountain, or a marsh at evening, it blends, not too badly, with all the other sleepy voices that, in croaks or chirrup, are saying the same thing.

He who drinks a tumbler of London water has literally in his stomach more animated beings than there are men, women, and children on the face of the globe.

—Sydney Smith, 1834

After a while the skilled listener can distinguish man’s noise from the katydid’s rhythmic assertion, allow for the offbeat of a rabbit’s thumping, pick up the autumnal monotone of crickets, and find in all of them a grave pleasure without admitting any to a place of preeminence in his thoughts. It is when all these voices cease and the waters are still, when along the frozen river nothing cries, screams, or howls, that the enormous mindlessness of space settles down upon the soul. Somewhere out in that waste of crushed ice and reflected stars, the black waters may be running, but they appear to be running without life toward a destiny in which the whole of space may be locked in some silvery winter of dispersed radiation.

It is then, when the wind comes straitly across the barren marshes and the snow rises and beats in endless waves against the traveler, that I remember best, by some trick of the

imagination, my summer voyage on the river. I remember my green extensions, my catfish nuzzlings and minnow wriggings, my gelatinous materializations out of the mother ooze. And as I walk on through the white smother, it is the magic of water that leaves me a final sign.

Men talk much of matter and energy, of the struggle for existence that molds the shape of life. These things exist, it is true; but more delicate, elusive, quicker than the fins in water is that mysterious principle known as “organization,” which leaves all other mysteries concerned with life stale and insignificant by comparison. For that without organization life does not persist is obvious. Yet this organization itself is not strictly the product of life, nor of selection. Like some dark and passing shadow within matter, it cups out the eyes’ small windows or spaces the notes of a meadowlark’s song in the interior of a mottled egg. That principle—I am beginning to suspect—was there before the living in the depths of water.

The temperature has risen. The little stinging needles have given way to huge flakes floating in like white leaves blown from some great tree in open space. In the car, switching on the lights, I examine one intricate crystal on my sleeve before it melts. No utilitarian philosophy explains a snow crystal, no doctrine of use or disuse. Water has merely leaped out of vapor and thin nothingness in the night sky to array itself in form. There is no logical reason for the existence of a snowflake any more than there is for evolution. It is an apparition from that mysterious shadow world beyond nature, that final world which contains—if anything contains—the explanation of men and catfish and green leaves.

Loren Eiseley, from “*The Flow of the River*.” “If there is magic on this planet, it is contained in water,” begins Eiseley’s essay, which first appeared in *The American Scholar*. At the time, Eiseley was a professor of anthropology at the University of Pennsylvania and curator of early man at the university’s museum. “The first point he wishes to make,” wrote W.H. Auden of Eiseley in 1970, “is that in order to be a scientist, an artist, a doctor, a lawyer, or what have you, one has first to be a human being.”

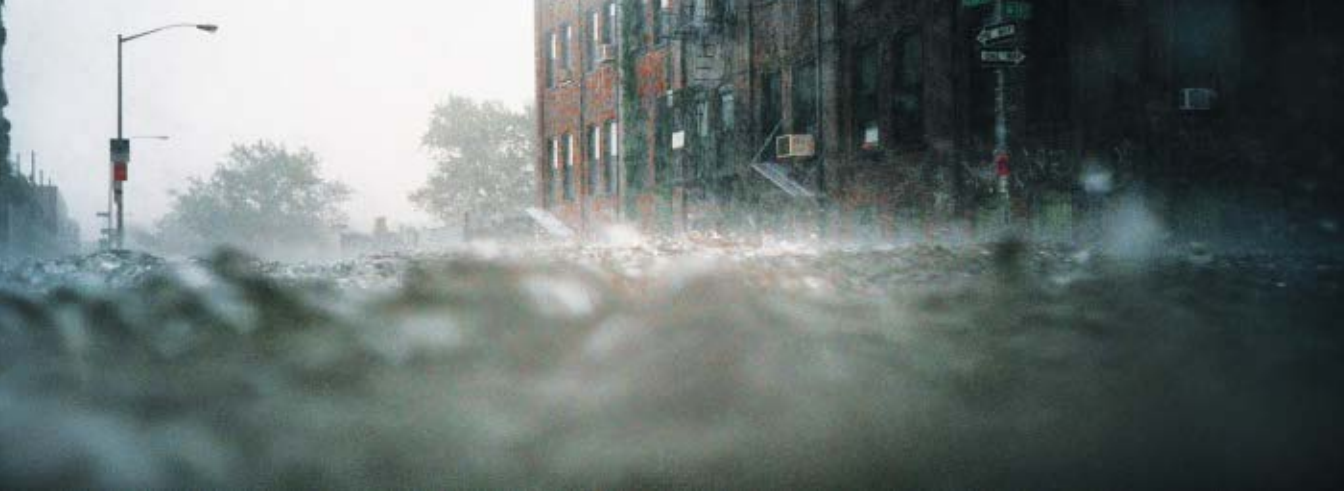
C. 1165 BC: Latium

CITY BANK

Aeneas, still disturbed about the war,
Laid himself down. After a little while
He dreamed, and into his troubled dream there came
The aged god himself of the beautiful Tiber,
Rising up from among the poplar leaves
That floated upon the water; his garment was
Thin-linen woven, gray; his head was crowned
And shaded with a wreath of river reeds;
He came to help Aeneas, and his words
Brought resolution to perplexity,
And quieted his disquiet, dispelling his cares:
“Seed of the race of the gods, you have brought back
Past enemies, our Troy to the Latin fields,
And the Laurentine soil waiting for you.
This is the dwelling place for your Penates—
You must not take your gods away from here;

Wave bowl, attributed to Christopher Dresser, 1880.





In September_two, by Gundula Friese, New York City, 2005.

Don't be afraid of the menacings of war;
The wrath of the gods against you is now subsiding,
And this is not the figment of a dream—
A giant sow in a grove of ilex trees
Along the shore has given birth just now
To thirty offspring of her milk-white body—
White sow reclining now upon the ground,
White newborn young being nourished at her teats.
This is the place where your city is going to be,
The place of rest from all you have undergone.
Here in this place, after the passing of thirty
Years in their turning, Ascanius will build
A city called, in glory, Alba, 'White.'
This prophecy is not uncertain; you
Must listen as I tell you in few words
How you will come, victorious, through all
This present circumstance. There are a people,
Who, following the flag of their king, Evander,
Came from Arcadia, descendants of Pallas,
Who when they chose the place upon the hills
Where they would dwell, and built their city there,
They named it Pallanteum in their forebear's honor.
They and the Latins are locked in incessant war.
Stretch out your hands to them, make them your allies,
Bring them into your camp, swear fealty together.
I'll show you how to go, upriver, to find them,
Rise up from your bed, O goddess-born, when the stars
Are setting and the day begins, and say
Your prayers to Juno, with supplicating vows
To win her favor and appease her wrath.
I will receive from you, when you are victor,
Your full payment to me of your vows and tributes.
I am that river that grazes between the banks
Of the rich fields, touching them tenderly,
I, cerulean river, most favored by

The heavens looking down. This is my home,
High cities witness my majestic flowing.”
He said these things and plunged into the pool,
Seeking the deepest reach of the river water.

Night and sleep departed from Aeneas;
He rose up from his bed and looked to the east,
Toward the rising sun and its ethereal light,
And then he went to the river and took water into
The hollows of the upturned palms of his hands,
And raised them up, according to the rite,
In offering to the deities of the place,
And spoke these fervent words in ecstasy:
“You nymphs, Laurentine nymphs, who dwell at the sources
From which the rivers flow, and Father Thybris,
You and your sacred river, accept Aeneas.
Protect him from the dangers that will come,
Wherever you are in the pools, or in the streams,
Whatever the source you flow from in such beauty,
Pitying us for our troubles. Our offerings
Will honor you forever, divine horned god
Of Hesperian waters. Be with me now, and by
Your presence show that you give us your assent.”
Aeneas thus in liturgy spoke these words.
And then, making ready, he chose two ships from his fleet,
Biremes, and chose the most skillful crews and armed them,
Preparing them for the journey up the river.

Then, suddenly, there was a wonderful portent.
Upon the green bank of the river, in
A grove of verdant sheltering trees, there lay
A white mother sow with her newborn young, all of them
Of the same white color as she; and father Aeneas,
While his chosen comrades witnessed at the altar,
Sacrificed them as an offering to you,
Great Juno, in honor of you. And all that night
The swelling waters of the river were
Quieted by Thybris, the current reversed,
And all was almost as if it were a pond,
And the way upriver upon the changed current was easy.

Virgil, from the Aeneid. Born to peasants near Mantua, Italy, in 70 BC, Virgil began composing this epic after being commissioned by Octavian around 30 BC, when the emperor returned from his victory over Antony and Cleopatra at Actium. It remained unfinished when the author died almost a decade later. Farmers in ancient Rome propitiated Tiberinus, god of the Tiber, every May, throwing twenty-seven straw dummies, called argei, into the river from a wooden bridge that remained from the early city.

2011: Sussex

TIME PRESENT, TIME PAST

I am haunted by waters. It may be that I'm too dry in myself, too English, or it may be simply that I'm susceptible to beauty, but I do not feel truly at ease on this earth unless there's a river nearby. "When it hurts," wrote the Polish poet Czeslaw Milosz, "we return to the banks of certain rivers," and I take comfort in his words, for there's a river I've returned to over and again, in sickness and in health, in grief, in desolation, and in joy.

I first came to the Ouse one June evening a decade back. I was with a boyfriend long since relinquished, and we drove from Brighton, leaving my car in the field at Barcombe Mills

All water has a perfect memory and is forever trying to get back to where it was.

—Toni Morrison, 1987

and walking north against the current as the last few fishermen swung their lures in hope of pike or bass. The thickening air was full of the scent of meadowsweet, and if I looked closely, I could make out a scurf of petals drifting idly along the bank. The river ran brimful at the edge of an open field, and as the sun dropped, its smell became more noticeable: that cold green reek by which wild water betrays its presence. I stooped to dip a hand, and as I did so, I remembered Virginia Woolf drowned herself in the Ouse, though why or when I didn't know.

For a while I used to swim with a group of friends at Southease, near where her body was found. I'd enter the swift water in trepidation that gave way to ecstasy, tugged by a current that threatened to tumble me beneath the surface and bowl me clean to the sea. The river passed in that region through a chalk valley ridged by the Downs, and the chalk seeped into the water and turned it the milky green of sea glass, full of little shafts of imprisoned light. You couldn't see the bottom; you could barely

make out your own limbs, and perhaps it was this opacity which made it seem as though the river was the bearer of secrets, that beneath its surface something lay concealed.

It wasn't morbidity that drew me to that dangerous place but rather the pleasure of abandoning myself to something vastly beyond my control. I was pulled to the Ouse as a magnet is pulled to metal, returning on summer nights and during the short winter days to repeat some walks, some swims through turning seasons until they amassed the weight of ritual. I'd come to that corner of Sussex idly and with no intention of staying long, but it seems to me now that the river cast a lure, that it caught me on the fly and held me heart-stopped there. And when things began to falter in my own life, it was the Ouse to which I turned.

A river passing through a landscape catches the world and gives it back redoubled: a shifting, glinting world more mysterious than the one we customarily inhabit. Rivers run through our civilizations like strings through beads, and there's hardly an age I can think of that's not associated with its own great waterway. The lands of the Middle East have dried to tinder now, but once they were fertile, fed by the fruitful Euphrates and the Tigris, from which rose flowering Sumer and Babylonia. The riches of ancient Egypt stemmed from the Nile, which was believed to mark the causeway between life and death, and which was twinned in the heavens by the spill of stars we now call the Milky Way. The Indus Valley, the Yellow River: these are the places where civilizations began, fed by sweet waters that in their flooding enriched the land. The art of writing was independently born in these four regions, and I do not think it a coincidence that the advent of the written word was nourished by river water.

There is a mystery about rivers that draws us to them, for they rise from hidden places and travel by routes that are not always tomorrow where they might be today. Unlike a lake or sea, a river has a destination, and there is something about the certainty with which it travels that makes it very soothing, particularly for those who've lost faith with where they're headed.



Sumatran ceremonial banner depicting three ships, eighteenth century.

The Ouse seemed to me then to be composed of two elements. On the one hand, it was the thing itself: a river forty-two miles long that rose in a copse of oak and hazel not far from Haywards Heath, dashing in quick gills and ripples through the ancient forests of the Weald, traversing the Downs at Lewes, and entering the oil-streaked Channel at Newhaven, where the ferries cross over to France. Such waterways are ten a penny in these islands. I dare say there is one that runs near you—a pretty, middling river that winds through towns and fields alike, neither pristinely wild nor reliably tame. The days of watermills and salterns may have passed, but the Ouse remains a working river after the fashion of our times, feeding a brace of reservoirs and carrying the outfall from a dozen sewage works. Sometimes, swimming at Isfield, you pass through clotted tracts of bubbles; sometimes a crop of waterweed blooms as luxuriant as an orchard with the fertilizer that's washed from the wheat.

But a river moves through time as well as space. Rivers have shaped our world; they carry with them, as Joseph Conrad had it, “the dreams of men, the seed of commonwealths, the germs of empires.” Their presence has always lured people, and so they bear like litter the cast-off relics of the past. The Ouse is not a major waterway. It has intersected with the wider currents of history only once or twice; when Virginia Woolf drowned there in 1941 and again, centuries earlier, when the Battle of Lewes was fought upon its banks. Nonetheless, its relationship with man can be traced back thousands of years before the birth

of Christ, to when Neolithic settlers first started to cut down the forests and cultivate crops by the river's edge. The ages that followed left more palpable traces: Saxon villages; a Norman castle; Tudor sewage works; Georgian embankments and sluices designed to relieve the river's tendency to overflow, though even these elaborate modifications failed to prevent the Ouse from rising up and cataclysmically flooding the town of Lewes in the early years of our own millennium.

At times it feels as if the past is very near. On certain evenings, when the sun has dropped and the air is turning blue, when barn owls float above the meadow grass and a pared-down moon breaches the treeline, a mist will sometimes lift from the surface of the river. It is then that the strangeness of water becomes apparent. The earth hoards its treasures, and what is buried there remains until it's disinterred by spade or plow, but a river is more shifty, relinquishing its possessions haphazardly and without regard to the landlocked chronology historians hold so dear. A history compiled by way of water is by its nature quick and fluid, full of submerged life and capable, as I would discover, of flooding unexpectedly into the present.

Olivia Laing, from *To the River*. Laing began this book, her first, in the wake of a breakup, and followed it with *The Trip to Echo Spring*, an investigation into writers' drinking habits. “Writing about water and drowning,” she said in a 2017 interview, “led me to think about drowning one's sorrow and the liquid lives of alcoholic writers.” She most recently published *The Lonely City*, an investigation into the relationship between isolation and creativity. In 2018 she was awarded a Windham-Campbell Prize.



A NEW ARK

by Nicolas Pelham

Few places would better qualify for hell on earth. In Basra, gas flares from oil wells shoot upward. They turn the sky orange at night and bake what is already one of the hottest places on earth by day. The ground is cooked to toast. The wreckage of past invasions and wars litters a landscape otherwise unremittingly barren and flat. Most of the palm trees that covered the surface have either wilted or been severed by shells. Slums spill out of Iraq's decrepit second city, adding the black stench of sewage to the assault on the senses.

Out of the desolation flow the cleansing, balmy waters of the Ahwar, Iraq's marshes. Barely an hour's drive north on the highway from Basra, left at a derelict paper mill, and beyond an army checkpoint, herds of water

buffalo slide into the cool shallows and bathe between the bulrushes. I went there in February, as spring was coming, and found Razaq Jabbar, a wizened boatman in a traditional black tunic crisply buttoned to the neck, waiting by his motorized *mashoof*, or gondola. He invited me and my traveling companions—Jassim al-Asadi, a director of Nature Iraq, which works to revive the wetlands, and my guide, Abbas al-Jabouri, and his teenage son—aboard, and steered his boat through a maze of reeds that bristled above marshlands stretching reassuringly beyond the horizon. As he sailed, he regaled us with the same songs he had sung a few months earlier to the Iraqi prime minister, Haider al-Abadi, in the same boat. He moaned for lovers lost forever in the harsh desert and

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delighted in new ones found among the wetlands. We clapped in accompaniment as he turned primordial fertility myths into song.

The return of the marshlands after a century of planned and unplanned desiccation is like Noah's flood in reverse. Ever since the 1970s, Turkey and Syria had dammed the Euphrates River and its tributaries, curtailing the annual deluge that cooled and enriched Iraq's flatlands with water and silt from Anatolia's snowcapped mountains. Formerly fast-flowing waters slowed to a trickle, or on occasion stopped altogether. Fields lost their fecundity and turned to crust. The Middle East's largest wetlands shrank and dried.

The military offenses of Saddam Hussein drained what remained. To flush out rebels, bandits, and army deserters hiding in the reeds after the Shia uprising in southern Iraq in 1991, his forces bombed the marshes, sowed mines in their waters, and buried the reeds beneath

He who would have clear water should go to the fountainhead.

—Italian proverb

tarmac. They dug a bypass canal 350 miles long and, with a network of earthen dikes and sluice gates along the Euphrates, diverted its waters. Evaporation in the intense heat finished the job. With the bare land exposed, Iraq's leader licensed companies to dig for oil and tapped one of the world's richest oil fields, Majnoon, or "Madness."

Without water the Madan, as the marsh Arabs of Ahwar are known, finally gave up their struggle for survival. For five thousand years they had withstood nature's challenges. They had tamed the floodwaters of the great rivers and spawned the world's earliest known civilizations and cities. Now they joined the ranks of the rural displaced converging on the slums ringing Iraq's cities or fled for camps in Iran. The UN's Environment Program called it "one of the earth's major and most thoughtless environmental disasters."

America's invasion of Iraq in 2003 brought salvation, at least for the marshes. Paul Bremer, head of the coalition authority and Iraq's proconsul, installed Abdul Karim al-Muhammadawi—a Madan guerrilla known as the Prince of the Marshes and head of the Shia armed group Iraqi Hezbollah—as one of Iraq's twenty-five governing councillors. And the U.S. Army Corps of Engineers helped marsh Arabs bulldoze and breach the dikes and quench their parched land. As mud turned to marsh, foxes and falcons returned, searching for prey. So, too, did the flamingos and the marsh Arabs. Today, only the prowling lions are missing. Chibayish, the main town, has as many inhabitants as it did before Saddam Hussein drained the marshes. On the little artificial islands of reeds that poke from the water, families have rebuilt their *mudhifs*, or guesthouses. Dried reeds bound together rise twenty feet high like little town halls, and are fitted inside with cushions. Now, as five millennia ago, homes take three days to build and are assembled without nails, wood, or windows.

Razaq Jabbar moored beside one where women were frying their catch of the day. We lunched on *qishta*, or buffalo cream, and *makhlama*, ground meat cooked with scrambled eggs and vegetables. Reeds are the basis for life—for housing, fodder, and matting. In this resurgent local economy, women fish, milk buffalo, sow rice, and weave reed mats. Men more casually hunt birds and ferry groups of delighted Iraqi tourists between the reeds in their motorboats.

Old-timers complain the waters are tamer now. The marshland covers only a half of its 3,500-square-mile span of a generation ago. It once extended 70 miles west, to Abraham's birthplace of Ur (now known as Nasiriyah), where a huge ziggurat rises out of the flats. But Razaq, the boatman, still remembers when floods were a regular occurrence. When the waters rose, his family would take to their boat and sometimes drift across borders into Iran. It might take a month before they moored again on dry land. Noah, the patriarch, might have



Blue Green Red, by Ellsworth Kelly, 1963. Oil on canvas, 91 x 82 inches.

remained afloat for longer, but the account of Al-Tufan, as the Flood is called in the Quran, sounded perfectly plausible. In winter, when the windows of heavens were opened and the fountains of the great deep broken up, as the Bible puts it, it was easy to imagine a biblical marsh sheikh building a vast boat to survive.

The Bible is frustratingly silent on Noah's whereabouts, as it is on all of the pre-deluge patriarchs. Local lore as well as scriptural research cites that lost paradise in the marshlands between the two rivers, or Mesopotamia, as the

Greeks called it. But what the Bible lacks in detail, local Akkadian, Sumerian, and Babylonian accounts of the flood myth provide. Ziusudra, Noah's Sumerian counterpart, came from Shuruppak, near Tell Fa'rah, 135 miles south of Baghdad. The Mandaeans, an ancient Iraqi sect, still worship by venerating Noah and baptizing in the Euphrates. If myths have roots in reality, it seems likely the ark was assembled in the wetlands of southern Iraq.

While we were afloat on the marshes, childhood images of the ark came into view. I

saw a huge wooden galleon painted by Flemish masters bursting at the seams with its cargo of animals. Elephant trunks and giraffe necks squeezed from windows. Camels and ostriches jostled for space a deck above. An entire aviary flew overhead. I made the mistake of sharing my musings with fellow passengers and was met with a chorus of rebuttals. What did seventeenth-century European artists know of the marshes? They modeled their arks on the merchant vessels that cruised the Pacific, not the craft of the marshes. How had the West drilled Eurocentric models into the human psyche, erasing the indigenous ship that the marshes

Water in motion is precise and sharp, clearly formed, holding specific postures for infinitely small frozen moments.

—Gary Snyder, 1953

might have produced? Could I not free my mind of its colonial implants and imagine the real ark?

I found an answer in a café opposite the Royal Academy in London, around the corner from my office. A bearded Iraqi artist bustled through the lunchtime rush carrying a reed basket the size of a beach ball. Rashad Salim placed it on the counter next to me and pronounced it to be a miniature replica of the real ark. Over the next hour he stripped me of the Western preconceptions I had derived from childhood puzzles. Noah would have dressed like a marshland boatman with a head scarf, not with the finery of a Renaissance Italian duke. He would have adapted local designs, not those of Europe's shipyards three thousand years into the future. Dating back to a time when the Bronze Age was still in its infancy, his tools would have been rudimentary, fashioned from plants the marshlands still offer. Rope came from palm fronds woven as tight and strong as modern-day fibers. Thorns made good pins.

With the floodwaters rapidly rising, said Salim, Noah would not have had time to travel up the Euphrates and over the mountains to

bring cedars from Lebanon. The hardwoods of the Flemish masters were a fantasy. Noah would have fashioned his boat from the trees that grew locally—palms, willows, and tamarisks. Pomegranate wands, prized for their flexibility, came from the orchards a day's march north, beyond Hilla. *Chiddem*, natural pitch used for waterproofing, oozed to the surface in Hit, a short journey up the Euphrates.

They were techniques tried and tested over centuries. "Coated with chiddem, a coracle is as waterproof as fiberglass," said Salim. "It can last for generations." In the late 1970s, as a young mariner in his twenties, Salim had built a raft of reeds called the *Tigris* and sailed with the Norwegian adventurer Thor Heyerdahl on the last of his transoceanic adventures, from Iraq's marshes across the Indian Ocean. In 2013, just before the jihadists of ISIS fanned across northern Iraq, he had boated down the Tigris River from Hasankeyf, Turkey. But reason, experience, and research suggested that a raft might have made an unlikely vessel to withstand the turbulent tides of a flood. And in search of the true ark, he delved deeper in search of ancient shipbuilding techniques. He scoured hundreds of flood myths for clues and interviewed old Madan craftsmen about the boats they built in an age when goods traveled between Basra and Babylon by river, not road.

For building blocks, concluded Salim after months of research, Noah would not have resorted to timber planks but to the locally made *guffa*, or coracle—a small round boat made of wicker. For millennia, until the juggernaut and the obstacle course of dikes and dams destroyed their business, the *guffa* had been the standard way of moving cargo. In old sepia photos, they bob in multiple sizes on the Tigris River, piled high with harvests and livestock bound for Baghdad's markets. The larger ones—twelve feet in diameter—could carry a bull and its fodder. They surface in the *Histories* of Herodotus, the Greek chronicler of the fifth century BC, and, says Salim, on ancient Assyrian reliefs ferrying chariots over rivers some three thousand years ago. Roman com-

manders, he adds, even used Mesopotamian boatmen, or *barcarii*, to ship their imperial armies around that remote island of Britannia. Iraqi landscape artists painted them in the nineteenth century, and Freya Stark, a British explorer and travel writer, photographed them in Baghdad in the 1930s.

Under pressure of time and rising waters, reasoned Salim, Noah and his team of craftsmen would have strung together dozens of coracles with palm-frond rope and stuffed the cracks in between with bundles of reeds. Rather than make only a single vessel, they would have assembled a floating village. “I imagine the ark not as a unique boat of monumental size that had never been built before,” says Salim, “but as a gathering of many ordinary vessels. It would have been a community contained within a structure of unity that would protect them from catastrophe.” A huge mudhif, or perhaps an entire hamlet typical of those sprouting again in the marshes, would have covered the surface, sheltering the pairs of animals onboard. The more predatory might have had their own coracles, perhaps capped with cages. The entire contraption would have been two hundred feet wide, as large as the Moscow State Circus.

Salim’s reasoning was more empirical than scriptural. He applied the precept of Karl Marx that the environment, not God, determines outcomes. It was also fashionably anti-colonial. Salim comes from a distinguished line of revolutionary artists. His uncle, Jawad, worked with vast tableaux, one of which—the *Monument of Liberation*—is an iconic masterpiece that records the 1958 revolution against the British-backed monarchy and still dominates Tahrir Square in central Baghdad. Salim’s tableau was southern Iraq. “The environment and the heritage provide the material for my art,” he told me. “The ark is my monument.” Just as Jawad Salim’s work had helped free Iraqi minds from royal hierarchies, so his nephew was seeking to rid the world of its Eurocentric view of the ark and reclaim the flood myth for the land that inspired it—Iraq.

That said, Salim’s coracle theory was not without scriptural foundations. The book of Genesis refers to an oblong ark, but the Hebrew word it used was *teva*, which appears only once elsewhere in the Bible—in Exodus to describe the crib or coracle in which Moses was placed in the bulrushes. Other ancient texts with striking similarities to the biblical flood story offer more clues. The *Epic of Gilgamesh* [*Sumer*, page 141], which presents the Mesopotamian tale of the flood, describes how Enki, the god of water, tasks Utnapishtim, the last righteous man, to preserve creation from the flood by building a giant ship called the *Preserver of Life* and

*There’s always a period of curious fear between
the first sweet-smelling breeze and the time
when the rain comes cracking down.*

—Don Delillo, 1982

filling it with baby animals. Afloat on the earth, Utnapishtim, like Noah, sends out a dove and a raven and, when the latter fails to return, releases his cargo and offers a sacrifice to the divine. But among the commonalities, there are several vital differences. Tablet number eleven of *Gilgamesh* describes how Utnapishtim takes not only his immediate family on board the *Preserver of Life* but also various local craftsmen who helped build and maintain his floating village. And it lists the dimensions as being two hundred feet in length, width, and height and mentions a deck space of an acre. *Gilgamesh*’s ark, in other words, was round.

Salim’s current production is less ambitious in time and scope. He has found an old weaver and has commissioned enough coracles to assemble a half-size model of the *Preserver of Life*. He already has ten large coracles (at a cost of five thousand dollars each) and twenty-one smaller ones, and if all goes to plan, he will set sail at the end of the year, drifting from Babylon—the site of Nebuchadnezzar’s capital on the Euphrates—and head 250 miles downstream to the marshes. He will stage

preliminary expeditions on Germany's Rhine and England's Thames to drum up awareness. He wants, he says, to reconnect global cultures to their natural environment. Through "a new social enterprise using art and design as a catalyst," he hopes to show how humans could best survive catastrophe not by the construction of a single boat of monumental size but by joining many ordinary vessels into "a structure of unity." His ark, he says, is a rant against individualism and an appeal for communal solidarity. It is a message he relays not just in the urban West, with its lack of community, but also back in his homeland, Iraq, soaked in the blood of sectarian and self-interested division.

In the meantime, Salim has hidden his thirty-one coracles, lest Iraq's predatory government steal his idea. But he arranged for me to have a sneak viewing. Abbas al-Jabouri, his friend and driver, took me to his home near Babylon, where I found the coracles stacked to the ceiling in the hallway of the upper floor

of his villa. Against the protests of al-Jabouri's long-suffering wife, you had to clamber over them to reach the adjoining rooms. But al-Jabouri delighted in his new role as Salim's shipbuilder and commissioner. No sooner had Iraq's forces chased Islamic State fighters from Hit than al-Jabouri drove there to buy pitch for waterproofing the coracles. Tanks and troops filled the town, but al-Jabouri had a knack of negotiating the gruffest checkpoints. He would wind down the window and proclaim with funereal gravity, "*Allah yirham amwatak*" (May God have mercy on your dead). The guards, he explained, would be too honored to ask further questions.

As in *Gilgamesh*, al-Jabouri was adamant that the ark builder would have needed faithful assistants like him. "Each coracle takes a month to make, but Noah wouldn't have been working alone. He would have had the village working for him," he said. Salim, he assured me, would follow Utnapishtim's example, not Noah's, and take him on board when the reimaged ark set

Marsh House Washed Away During Superstorm Sandy, by Doug Kuntz, 2012.



sail. But al-Jabouri looks like a portly manager in jacket and tie, while Salim has the wild look of an ancient mariner. I was doubtful.

Few Iraqis, though, are as loyal as al-Jabouri. A prophet, after all, is never accepted in his hometown, and I found many Iraqis to be as mocking of Salim's venture as the locals were of Noah's. In Nasiriyah, beside the towering ziggurat of Ur, Abraham's birthplace, I met Abdulameer al-Hamdani, a professor of antiquities and a well-traveled lecturer on the international circuit. He exuded the urbane formality of the roving academic. In his blue jacket and matching blue shirt, he was even more dapper than al-Jabouri. But the persona disguised a marsh Arab who spoke with the authority of experience. "Of course," he told me after a brief exchange of introductions, "I grew up in the floods." He had been born and raised in the marshes, and found the notion of survival for forty days and nights entirely conceivable. Before the mass construction of dams, as a child he had watched as his reed school rose off its island perch and floated downstream. He had kept moving ever since. He went to the University of Baghdad and then the State University of New York, where he wrote his doctorate on the wetlands. When we met, he was packing for a fresh post at Durham University in England to teach how to preserve endangered heritage in times of conflict.

Salim had suggested that al-Hamdani would shed light on the connection between the ark and his coracles, but within minutes he was debunking his theories. "I've lived on the marshes my entire youth. My father had a huge boat, but I've never seen a circular craft," he told me. His readings of ancient cuneiform left him skeptical, too. "There's no record anywhere of a round boat south of Babel," says al-Hamdani. Ancient Sumerian and Assyrian reliefs and cylinder seals portray crescent-shaped rowing boats. And he found the notion of a circular ark moving upstream fanciful. Though they differ on the exact location of the ark's final resting place, both the Bible and the Quran agree it was hundreds of miles to the north, in the

mountains of Anatolia. Salim's mission to populate the marshes with huge coracles seemed as alien as the tilapia that prey on the indigenous carp. He was also bothered by Salim's sourcing of building materials. "I've never seen any boats made of palm trees. I'm not sure it would have lasted very long."

The Flood has inspired many myths. Does the veracity of another one matter? Salim admits that his intention is less to prove what the ancient ark was like than to preserve what is meaningful and beautiful in the first civilization and protect it from the destruction of the contemporary one. Flying out of Iraq over Turkey, I looked over a landscape of man-made lakes flooding the highlands for the first time since Noah. A profusion of dams was again threatening habitation, this time

Greeting cards routinely tell us everybody deserves love. No. Everybody deserves clean water.

—Zadie Smith, 2000

one as old as civilization itself. Downstream, too, the dams have led to a fall in water levels in Iraq's rivers by more than half in recent decades. Completion of Ilisu, one of the longest among the more than twenty-two dams Turkey is building along the Tigris and Euphrates Rivers as part of its Southeastern Anatolia Project, has been mercifully delayed, but only until the summer. And Iran is the latest neighbor to dam its tributaries to the marshes. Over the past decade it has redirected the Karun River away from Iraq. Current water levels in the wetlands have diminished 40 percent from last year to less than a meter. The summer evaporation will send the levels even lower. Daily catches, complain the fisherwomen, have dropped by more than three-quarters. Yet Salim seems stoic. "Empires have come and gone, but until modern times we never lost our environment," he says. If Salim's ark can raise concern for the threatened marshlands, it, like Noah's, might again save the first ecoculture from destruction.



Cloud, Puddle, Tree, by Andrea Scher, 2017.

A COMPASSIONATE SUBSTANCE

by Philip Ball

Water attracts trouble. Time and again this ubiquitous and vital substance becomes the subject of controversial claims. The latest is about “raw” or “live” water, consumed directly from natural springs with no treatment or purification.

It’s largely a Silicon Valley thing. About thirty dollars will buy you five gallons from the Oregon-based company Live Water.

Sure, raw water might be full of other stuff like bacteria, algae, and minerals. But these, say devotees, are good for us—unlike the anti-microbial agents and additives in tap water or the plastic additives leached into bottled water. Fluoride, added to tap water for dental health, has a particularly long history of health scares and conspiracy theories; in the 1950s some said fluoridation was a communist plot to undermine

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the health of Americans. Raw-water advocates contend that fluoride is neurotoxic even at very low levels, although there's no evidence of that.

I'll happily attest that spring water straight from the source can be splendid—if you have the right source. But no law of nature prescribes it free from nasty pathogenic bacteria such as *Shigella* or parasites like *Giardia*. “I can't stress enough how many lives have been saved because of functioning water and wastewater treatment facilities,” writes Gail Teitzel, editor of the journal *Trends in Microbiology*.

At any rate, raw water hardly qualifies as the “purest substance on the planet,” as it has been advertised. If that were so, whither the assertions that water is “so much more than just H₂O molecules” and that purified water (here called “refined H₂O,” which is entirely harmless) is “dead”?

It's all so confusing. Notions of purity seem to have come unstuck from any conventional definition of that word. But where water is concerned, such dissonances shouldn't surprise us. While clothed in scientific-sounding language, the rhetoric of the raw-water movement taps into an ancient discourse about the values of water. It is indeed “much more than just H₂O molecules” because it has nurtured human civilizations throughout time. It is a sacred substance, and in their confused and sometimes misleading way, raw-water enthusiasts are at least attempting to honor that legacy.

When science advances in ways that challenge old beliefs, what results is often not simply the displacement of one by the other. Some beliefs don't persist just because they haven't yet been disproved. When they serve a deep psychological purpose, they're likely to evolve to accommodate new information. Water demonstrates this again and again.

It is the original purifier. “If I were called in/To construct a religion,” wrote poet Philip Larkin, “I should make use of water.” By baptism it cleanses the believer for a life reborn; blessed by a priest, it confers protection from evil. The tensions of the Israeli-Palestinian conflict have been exacerbated by water issues not only via restrictions placed on Palestinian access to aquifers

in the West Bank but also by the collision of water values: some Muslims, for whom the ritualistic use of water is of profound importance, regard Israeli use of water resources as profligate and negligent. (Of course, Jewish tradition also advises respect for water.) In 1871 the anthropologist Edward Burnett Tylor described how water's sacredness seemed to make it invulnerable to contamination in the Middle East: the faithful Persian “may be seen by the side of the little tank where scores of people have been in before him, obliged to clear with his hand a space in the foul scum on the water, before he plunges in to obtain ceremonial purity.” It would take a powerful belief in water's self-cleansing propensity to keep Hindus taking purifying dips in the dreadfully polluted Ganges.

Science, you might think, can clear (if not clean) these things up. A good chemical and microbiological test will reveal exactly which noxious substances a sample of water might contain and in what doses. But scientific studies have sometimes supplied an apparent rationale for sustaining the mystical attributes of plain old H₂O—such as the “memory of water.”

At a rather strange conference on water in 2004, I met the French immunologist Jacques Benveniste. He was charming, witty, and seemingly comfortable in his role as scientific pariah. Benveniste was convinced that he had been “punished” for the embarrassment he had caused the editor of *Nature*, the august science journal that published his paper on the so-called memory of water in 1988.

I had joined the editorial team at *Nature* just weeks after its publication, and so had a ring-side seat for the entertainment that followed. Far from opposing Benveniste's paper, *Nature's* editor, John Maddox, had pushed it into print against the instincts of his staff. If Maddox had a feud with Benveniste, it was certainly not an establishment-versus-outsider conflict but was more a spat between two mavericks. Maddox's “investigation” of Benveniste's research after the paper was published was unconventional, to say the least: he traveled to the French lab to see

attempts (ultimately unsuccessful) to replicate the findings, accompanied by a specialist in scientific fraud and the professional magician and “pseudoscience debunker” James Randi.

Benveniste’s team had reported studies of one component of our cells’ immune response: the release of the chemical histamine from certain types of white blood cells when they encounter an allergen. The researchers could provoke this response using a protein molecule called an antibody that attached itself to the cells’ surface. But because the cell response sometimes seemed out of proportion to the amount of antibody present, they tried systematically diluting the antibody and seeing how the cells reacted.

When you drink water, think of its source.

—Chinese proverb

What they found made no sense according to the standard principles of chemistry. As dilution steadily reduced the amount of antibody, the activity of the cells didn’t fall off but instead kept resurging. At first glance this rise and fall looked random, but Benveniste and colleagues discerned a pattern within it: an approximately regular oscillation of activity reappearing at certain intervals of dilution. What’s more, this behavior persisted up to an extremely high level of dilution: so dilute, in fact, that there should not have been a single antibody molecule left in the solution. The French team concluded that somehow the water was “remembering” the presence of the antibody long after it had been diluted to nothing.

The controversy caused by the paper’s publication in the world’s most prestigious scientific journal wasn’t just about the apparent clash with what all scientific experience would lead one to expect. Biological activity in a solution of some ingredient diluted to the vanishing point seemed to vindicate the claims made by homeopathy, which employs ultrahigh dilution of the “active” compound.

Ever since its introduction in the mid-eighteenth century, homeopathy has defied con-

ventional scientific wisdom. Its inventor, German physician Samuel Hahnemann, claimed that it cured disease by treating “like with like.” The cure comes from an ingredient that, if administered in more than a “homeopathic” dose, would cause the disease or something like it. Homeopathic remedies were prepared from some highly toxic substances, such as arsenic and belladonna, but such was the dilution that they caused no ill effects. No study has ever shown convincing evidence that homeopathic medicines work beyond the placebo effect. But in Hahnemann’s time, many conventional medicines were also useless—and sometimes so positively harmful that giving patients nothing but water may have seemed effective in comparison.

Some homeopaths still seek vindication in Benveniste’s “memory of water.” But his results were never repeated in a careful and convincing experiment. Unless the results were fabricated (which I do not believe) or bungled, something odd really did happen in Benveniste’s experiments. But cell biologists know how unpredictable living cells are. The research is a textbook case of what American chemist Irving Langmuir in 1953 christened “pathological science”: it found a phenomenon that was barely detectable, hard to repeat, conflicts with all previous experience, and is explained with arbitrary invention and defended with ad hoc excuses.

I believe Benveniste was sincere in his convictions. But he made it hard to respect that sincerity. Rather than trying to systematically pin down how his strange findings had come about by simplifying his experimental system, he investigated ever-more complicated and uncontrollable manifestations of the alleged memory of water, testing his high-dilution solutions on rabbits and plants. He ended up claiming he could use radio waves to program biological activity directly into water according to what he called “digital biology.” Water, he said, acts as a “vehicle for information”—a receptive medium of infinite capacity and versatility.

There is something wonderfully alluring about the idea of a universal medicine in unlimited supply. Water is, after all, essential for

life, and a shot of it can be deliciously reviving. It's no wonder that it should be reimagined as a panacea. "We attribute to water virtues that are antithetic to the ills of a sick person," wrote French philosopher Gaston Bachelard in his 1942 treatise on the poetics of water, *Water and Dreams*. "Man projects his desire to be cured and dreams of a compassionate substance."

There is no better encapsulation of water's sacred mythology than that conjunction: a compassionate substance. Chemists might balk at this juxtaposition: as though mere chemical compounds could have such attributes! But chemists do it themselves, recognizing the mythic dimension of gold when they call it a "noble metal" (they quietly redefine *noble* to mean "unreactive," but don't be fooled). Some material components of our world have, through their constant presence in history, acquired psychic associations. Bread and grain are more than sustenance, air more than a mix of gases, diamond more than an optically transparent solid. Water is indeed not just H₂O.

That's true even in chemical terms—and therein lies water's potential for spawning pseudoscience. For one thing, water is a fabulous solvent; things dissolve in it so readily that it's all but impossible to keep them out. Water soaks up oxygen and carbon dioxide from the air, and that makes plant and animal life possible below the ocean surface. Even the atoms in water itself aren't all united as H₂O molecules. At any moment, a small proportion of them have fallen apart into electrically charged fragments, hydrogen and hydroxide ions; an excess of one or the other turns the water acidic or alkaline, respectively.

Besides, the simple chemical formula H₂O hides a formidable complexity at the molecular scale. Water molecules may form weak chemical links with one another, called hydrogen bonds, and via these unions—which are constantly being made and broken—the molecules in liquid water become joined into a gigantic network that is constantly shifting, breaking, and reforming, arranging the molecules into

temporary structures and clusters with less randomness than is seen in many other liquids.

Water isn't unique in forming hydrogen bonds, but it is the only common substance that can be joined by these gentle, frangible molecular handclasps into a three-dimensional network. Most liquids are little more than a disorderly scrum of jostling molecules. But water is delicately poised between order and disorder, constantly adopting a defective version of the framework structure that, in ice, immobilizes the water molecules into crystalline regularity.

It's extremely hard to find the right scientific language to describe this dynamic state, and molecular scientists who study water still

Water is the first principle of everything.

—Thales of Miletus, c. 600 BC

debate how to do that. This leaves an ambiguity about the structure of water that allows superficially plausible pseudoscience—and its relative, pathological science—to slip in.

In the mid-1960s a team of scientists in the Soviet Union led by the distinguished physical chemist Boris Deryagin reported they had discovered a new type of water that formed when it was contained in very narrow glass capillary tubes. This stuff didn't flow like the ordinary liquid but had a gummy consistency. They called it "anomalous water."

Soon other groups reported experiments that seemed to verify the claim, and it was suggested that this new form of water might arise from a more robust form of hydrogen bond linking the H₂O molecules into a kind of polymer. It became known as polywater.

Yet these ideas didn't fit with standard thinking about what water should be like, and they were hotly contested over the next several years. Eventually most researchers accepted that what the Soviets had seen was a solution contaminated by impurities, perhaps silicate material leached from the tubes' glass walls—"polycrap," as one critic put it. By 1973 Deryagin himself had capitulated to this interpretation,

and polywater was dismissed as bad science—or another example of pathological science.

The furor about “cold fusion” is yet another pathological episode that hinged to some degree on the real mysteries of water’s properties. In 1989 two chemists claimed to have conducted energy-releasing nuclear fusion on a laboratory workbench in a beaker of dissolved salts, drawing strength from old ideas about water as fuel, which also sustain perennial tales of vehicles and engines that run on water alone.

These theories are part of an old tradition. In some ways it harks all the way back to the transmutation of water by holy blessing to make it a potent prophylactic against the devil and a solvent for purifying and washing away sin.

In the eighteenth century, the German physician Franz Anton Mesmer offered “cures” involving the insertion of magnetic rods into baths in which his patients were immersed.

A fool and water will go the way they are diverted.

—Ethiopian proverb

Water seemed to become a conduit for an “animal magnetism” that Mesmer claimed to be able to command and channel. The belief that water can be altered by magnetism persists. You can still buy magnetic devices that allegedly counteract the effects of hard water and prevent scaling of kettles. There’s no reason to suppose they work and no scientific argument for why they should. Nevertheless, I was once assured by a respected physicist that stirring a glass of water with a magnetic rod changes its viscosity and mouthfeel.

Water energized to some peculiarly “vital” state is an old dream, too. In the 1920s and 1930s, an Austrian forest warden named Viktor Schauberger claimed he could make what he called “living water” by sending it down specially constructed channels to activate it with the energy of vortices created by the flow. He developed a theory for how these vortices could release energy by

inward bursts he called implosions, which could develop a thrust that might power flying devices. It was rumored that Schauberger was forced to work on secret weapons for the Nazis during World War II to exploit this principle. After the war, entrepreneurs brought him to the U.S., but he returned to Austria, convinced that the military was trying to steal his ideas.

New scientific understanding simply creates new niches where these old notions may flourish. I once spent a couple of hours with a very famous pop singer hosting a group of Russian scientists in her elegantly minimal London residence while the scientists sought to persuade me that they had developed some manner of treating water—I think it involved electromagnetic fields—to “neutralize radioactivity” and thereby decontaminate the lakes around Chernobyl. When I explained to the assembled company that radioactive decay does not really respond to this sort of intervention, I was offered an explanation based on quantum mechanics. I have heard nothing of this solution for radioactive decontamination since, but the technique (“quantum resonance technology”) resurfaced for the production of yet another brand of health-giving, and expensive, bottled water, Kabbalah Water. I sense a pattern here.

Supercharging water to confer restorative virtues is a recurring theme in the mystical pseudoscience associated with “hydration.” The company behind Penta Water—a bottled water produced in Southern California—originally claimed it had been “restructured” at the molecular level, which somehow produces better hydration. They no longer advertise that idea but instead boast of a formidable series of purification steps that, for fans of raw water, must leave Penta Water as dead and sterile as could be imagined. (Ultrapure water, used for industrial processing of semiconductors, is in fact said to taste bitter, and to leach minerals from the body to a degree that won’t do your health any favors, even if it’s not as lethal as it is sometimes claimed.)

But high tech is not always required to “improve” water. The Japanese writer Masaru Emoto claimed in his best-selling book *The*

Hidden Messages in Water (released in English translation in 2004 and popularized the same year in the film *What the Bleep Do We Know!?*) that human consciousness can influence water at the molecular level thanks to the transmission of emotional “energies” and “vibrations.” The effects, he said, can be seen in the transformative influence of Buddhist prayer on the forms taken by water as it crystallizes into ice. Music has this effect too: crystals exposed to Elvis singing “Heartbreak Hotel” split in two.

This is indeed industrial-strength water pseudoscience. But it has traction because—whether knowingly or not—it was planted in such rich soil.

Nothing better illustrates the coexistence of old beliefs and new science in the study of water than the way many of today’s water companies still employ dowsing, with handheld divining rods, to locate underground sources such as pipes or aquifers. When British science blogger Sally Le Page revealed the ongoing practice in 2017, it sparked a furious debate about the value of dowsing. Perhaps the most revealing aspect of the affair, however, was the merry insouciance with which water companies and their engineers admitted to sometimes taking up the bent rods—as though this was simply a good, old-fashioned, and cheap alternative to satellite-surveying methods. They use dowsing, they explained, because it works for them.

But as the old adage goes, the plural of anecdote is not data, and the most extensive tests of dowsing under scientific conditions, conducted in Germany in the 1980s, showed that it located water sources no more reliably than chance. This is hardly surprising, for there is no known physical force or mechanism that could explain why water flowing underground or under a floor should cause rods clasped in the hand to move. The only plausible reason why water might be found this way with better than chance efficiency is that the dowser has developed a good intuition for signs of possible water sources (the nature of vegetation, maybe?) and subconsciously causes the rods to cross.

The tradition of water divining is ancient; the Roman writers Pliny the Elder and Vitruvius mention it. But it was not until the sixteenth century that Georgius Agricola, a German expert on mining, mentioned the use of handheld rods or twigs for earth divining; he offered a skeptical appraisal of how miners used it to locate mineral and ore veins. There are records of the use of twigs to find water from around the same time.

Dowsing, like astrology, retains aspects of a quasi-animistic vision of the natural world, with roots in the early Renaissance tradition called natural magic. The world of the natural magician was a web of hidden (occult) forces woven by God with design and purpose. This design was thought to be imprinted on nature and could be “read” by those who knew how—so that, for example, herbs with particular healing powers resembled the parts of the body they could be used to treat. In such ways, the cosmos is imbued with

Water, thou hast no taste, no color, no odor; canst not be defined, art relished while ever mysterious.
—Antoine de Saint-Exupéry, 1939

properties that make human habitation possible. Our existence within it is no mere accident, for our very presence awards it meaning.

That was doubtless a consoling thought when Copernicus’ heliocentric theory threatened to dislodge the Earth from a central position in all creation. But this notion also has a modern scientific equivalent, and you might not be surprised to hear that it makes use of water. In 1913 the American biochemist Lawrence Henderson argued that water seems uniquely “fit,” in the Darwinian sense, to act as the solvent of life. “Water, of its very nature,” he wrote in his book *The Fitness of the Environment*, “as it occurs automatically in the process of cosmic evolution, is fit, with a fitness no less marvelous and varied than that fitness of the organism which has been won by the process of adaptation in the course of organic evolution.” In water’s unusually high capacity to hold heat,

keeping lakes and oceans at a stable temperature through the seasons; its large “latent” heat of evaporation and condensation, which helps redistribute heat across the globe as the sea surface evaporates and rain clouds condense; its power as a solvent delivering minerals to organisms; its large surface tension, which lets it rise high above the ground in the capillary systems of plants; and other properties that mark it out from other liquids, water seemed, in Henderson’s view, just what is needed to sustain life on our planet.

There’s a clear invitation to see this as an “argument from design” for the divine creation

*Water astonishing and difficult altogether
makes a meadow and a stroke.*

—Gertrude Stein, 1914

of the cosmos. Henderson refrained from any direct statement about whether water is indeed “purposeful” in this sense. But scientists today continue to ask: Is water indeed somehow uniquely suited to acting as life’s matrix—or does it just look that way to beings adapted to living in a watery world?

Here again the old idea that water’s agency is somehow bound up with human existence finds new apparel from the science of the times. If water had an anthropocentric “purpose” in the twentieth century, it would have to be expressed in the languages of physical chemistry and Darwinism. That Darwinian theme is echoed today in the claim of raw-water enthusiasts that we are “adapted” to the waters of natural springs, not those artificially purified of all other ingredients. There’s no factual basis for that assertion—there would be no adverse consequences from drinking only filtered water, but you’d suffer plenty from drinking water that natural selection has populated with microorganisms—although it makes sense against the backdrop of a belief in a teleological universe.

How dismayed should we be by the survival of mystic ideas about water? While there can be

a hectoring edge to the advertisements warning that you will not be properly hydrated without an expensive brand of bottled water, most people are unlikely to be taken in by it. Rather, such fads and fashions are typically just one expression of a lifestyle choice. Beliefs about water here serve a symbolic function: they express, in what might sometimes be a clumsy and garbled way, an ancient sense of why water is important beyond its chemical formula.

And it is, of course. All cultures have a tradition of respect for water because that is how they survived. Sacred springs exist in many cultures, and our stories and philosophies encourage care of water resources. “The highest good is like water,” wrote Lao-tzu in the foundational text of Chinese Taoism. Water offers a metaphorical model for good conduct both in that tradition and in Confucianism. The Hani, Deang, and Naxi ethnic minorities in Yunnan Province in China fetch water at the dawn of the new year to bring good luck and prosperity. Pools and wells all over Southeast Asia are said to be guarded by dragons, as though to say, You abuse water at your peril.

The price we pay, though, for these important and indeed sacred associations of water is that they may distort, even traduce, our scientific understanding of this decidedly strange substance. This is not, as is often implied, because New Age mystics, health gurus, and Gwyneth Paltrow are drowning out the voices of sober scientists. For as we’ve seen, science is itself vulnerable to our deep-seated intuitions about water. We haven’t seen the last of strange “water science.”

The fact is that, when we study water, we study dreams and myths. As Bachelard discerned, we conjure up reveries of birth, of milk and blood, of change and flux, of healing and succor, but also Poe’s nightmarish maelstrom and the deathly tug of the Styx. “One drop of powerful water,” he wrote, “suffices to create a world and to dissolve the night.” No microscope or spectrometer can contain all of that; it leaks off the slide and out of the frame, and flows everywhere.

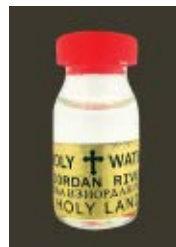
CONVERSATIONS



SAINT TERESA OF ÁVILA

The Life of Saint Teresa of Ávila, 1565

I have learned from the experience of several occasions that there is nothing the devils fly from more promptly, never to return, than from holy water. They fly from the cross also but return again. So there must be a great virtue in holy water. For my part, I feel a special and most notable solace in my soul when I take it up. In fact, I am generally conscious of a refreshing power in it that I could not describe. It is like an inner delight that comforts my whole soul. This is not fancy, or something I have experienced once only; it has happened again and again, and I have observed it with great care. It is as if one were very hot and thirsty, and were suddenly to drink from a jug of cold water; one's whole being seems to feel refreshed. I often reflect on the great importance of everything ordained by the church, and it delights me greatly to see that her words are so mighty as to impart their power to this water and make it so very different from water that has not been blessed.



REVIEWS ON

AMAZON.COM

Holy water from the Jordan River, c. 2017

This water was delicious. I instantly felt my spirit renewed and thirst quenched after drinking it.

I hope I'm right to trust this is real Jordan River water. It seems to work as we needed. Before we bought it, the negative activity in our house had gotten to the point where it was becoming threatening. Things have been so much more settled now.

I was having problems with my eyes, so I took a couple of drops and placed them in a cross formation onto each eye. The pain went away instantly.

I can't really say if the item was "really" from the Holy Land, but I can say it did bring me comfort, so that's what matters.

Didn't perform miracles. My mother appreciated the sentiment, but results were pedestrian.



PLINY THE ELDER



LEONARDO DA VINCI

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A book showing how the waters safely bring down timber cut in the mountains.

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A book of the mountains that would stand forth and become land if our hemisphere were to be uncovered by the water.

A book of the earth carried down by the waters to fill up the great abyss of the seas.

A book of the formation of hills of sand or gravel at great depths in water.

A book of the leveling of waters by various means.

A book of guiding rivers that occupy too much ground.

A book of parting rivers into several branches and making them fordable.

A book of the origin of rivers that flow from the high tops of mountains.

A book of controlling rivers so that the little beginnings of mischief caused by them may not increase.



RABINDRANATH TAGORE FLEUR ADCOCK



Lover's Gift, 1918

The girls are out to fetch water from the river—
their laughter comes through the trees, I long
to join them in the lane, where goats graze in
the shade, and squirrels flit from sun to shadow,
across the fallen leaves.

But my day's task is already done, my jars are
filled. I stand at my door to watch the glistening
green of the areca leaves, and hear the laughing
women going to fetch water from the river.

It has ever been dear to me to carry the
burden of my full vessel day after day, in the
dew-dipped morning freshness and in the tired
glimmer of the dayfall.

Its gurgling water babbled to me when my
mind was idle, it laughed with the silent laughter
of my joyous thoughts—it spoke to my heart
with tearful sobs when I was sad. I have carried
it in stormy days, when the loud rain drowned
the anxious cooing of doves.

My day's task is done, my jars are filled,
the light wanes in the west, and shadows gather
beneath the trees; a sigh comes from the flow-
ering linseed field, and my wistful eyes follow
the lane that runs through the village to the
bank of the dark water.

"Water," 1997

I met an ancestor in the lane.
She couldn't stop: she was carrying water.
It slopped and bounced from the stoup
 against her;
the side of her skirt was dark with the stain,
oozing chillingly down to her shoe.
I stepped aside as she trudged past me,
frowning with effort, shivering slightly
(an icy drop splashed my foot too).
The dress that brushed against me was rough.
She didn't smell the way I smell:
I tasted the grease and smoke in her hair.
Water that's carried is never enough.
She'd a long haul back from the well.

No, I didn't see her. But she was there.

MISCELLANY

Thirteenth-century Japanese Buddhist Mugai Nyodai, the world's first Zen abbess, struggled to achieve enlightenment until, one night during her training, the bottom fell out of an old bamboo-bound pail she was using to carry water. The spill freed her. "No more water in the pail!" she wrote in a poem commemorating the experience. "No more moon in the water!"

An antigerm campaign to outlaw the shared drinking cups used at public fountains spread through the United States in 1911. One pamphlet referred to the "cup of death"; another showed the Grim Reaper enticing a young girl to take a sip. Illinois declared the practice "as antiquated as the ducking stool and the inquisition," while the American Medical Association noted a curious new "jet apparatus" that could keep a child's lips from touching a water spout.

Analysis of lead pipe from the buried city of Pompeii revealed in 2017 that the Roman water supply may have had high levels of antimony, a toxic element likely used to increase the pipes' strength. "It's bigger than the diarrhea," said an expert in archaeological chemistry about antimony's possible effect on the population. "It's the decline of the Roman Empire in 476."

The gaseous relief offered by carbonated water when drunk after heavy kosher meals made seltzer popular among early twentieth-century Jewish immigrants from Eastern Europe, who accordingly gave it the nickname *belchwasser*.

The story of Juan Ponce de León searching for the Fountain of Youth in Florida in 1513 was fabricated after his death in a chronicle by Gonzalo Fernández de Oviedo y Valdés, a Spanish courtier who found the explorer to be egocentric, dim-witted, and gullible—and so wished to render him foolish in the annals.

"To cross a great river," advises a third-century Chinese alchemical text, you should smear a mixture of mercury, carp gall, and dragon grease on the bottoms of your feet. "When you walk on the water, you will not sink."

In an experimental paper published in the *International Journal of Nanotechnology* in 2016, researchers reported discovering a phase of water that is not solid ice, liquid water, or vapor gas. The fourth state is found at around 50 degrees Celsius and behaves a bit like liquid crystal.

Valhalla, the mythical hall for slain Norse warriors, is said to cater a nightly feast of boar meat but to offer no water to wash it down. According to the chief speaker of Snorri Sturluson's *Gylfaginning*, the warriors would have received a disappointing reward for their agonizing deaths in battle if served merely water. The menu instead includes mead supplied from the udder of a she-goat named Heidrun.

Many medical experts disdain the widely circulated idea that adults need to drink eight glasses of water per day; most agree that solid foods alone provide enough hydration. Barbara Rolls, a nutrition researcher at Pennsylvania State University, was asked in 2001 about the origin of the spurious rule. "I can't even tell you," she said, "and I've written a book on water."

Observing Mars through his telescope in 1877, Milanese astronomer Giovanni Schiaparelli saw oceans and *canali*, meaning channels. The latter was mistranslated into English as *canals*, implying Martian-made waterways, and an amateur astronomer named Percival Lowell soon began publishing books pointing to these as evidence of life on Mars. By 1910 photographic technology had advanced sufficiently to debunk his extrapolated theories.

A 2018 study of sediment cores taken from the bed of Walden Pond found signs of “cultural eutrophication”: human urine released into the pond since it became a popular swimming spot in the 1920s has altered the water chemistry and could turn the “beautiful clear lake into a slimy green stew.” The study was reported in the *Boston Globe* with the headline PLEASE STOP PEEING IN WALDEN POND, RESEARCHERS BEG.

Tacitus reports in his *Annals* that Nero’s “passion for extravagance” brought disrepute and danger in the year 60 when the emperor went bathing in the spring that fed the Aqua Marcia, the aqueduct believed to deliver Rome’s healthiest drinking water. Nero “profaned the sacred waters,” complains Tacitus, and “the divine anger was confirmed by a grave illness that followed.”

A 1551 municipal law in Lisbon regulated water at the Palacete Chafariz d’el Rei, segregating access across six spouts: the first for “slaves, freedmen, black people, mulattoes, and Indians”; the second for galley slaves; the fifth for “black and mulatto women and Indian women, both freed and captive”; and the sixth for white women and girls. White men and boys got the middle spouts, the third and the fourth.

A March 2018 report in the *Wall Street Journal* about a pre-Passover speech delivered by Israel’s prime minister included an error; a correction ran the following day. “An earlier version of this article incorrectly stated Benjamin Netanyahu said Moses brought water from Iraq,” it read. “He said the water was brought from a rock.”

In 1967 Bobby and Ethel Kennedy participated in the tenth annual Hudson River Whitewater Derby. Bobby’s kayak capsized in the freezing water; he was hurtled down the rapids. The next day Ethel attempted the course, accompanied by a ski expert and a mountain guide; the trio’s canoe tipped over three times. “A rescue party’s been sent up the river to get Mrs. Kennedy, who is on a rock,” an announcer told those waiting at the finish. “She’s having a bad day.”

During a battle with Scythians in Macedonia on April 29, 1091, Byzantine emperor Alexius I Comnenus noted the midday sun “shedding its rays,” reported his daughter Anna Comnena in the *Alexiad*. He dispatched local peasants to bring water in skins or jars to his troops, who “sipped a drop of water, then returned to the fray.” The newly hydrated Byzantines wiped out their enemies, and a chant began: “All because of one day the Scythians never saw May.”

Egyptian pop singer Sherine Abdel-Wahab was sentenced to six months in prison in 2018 for insulting the Nile. Asked by a fan to perform her hit song “Have You Drunk from the Nile?,” Abdel-Wahab responded, “You are better off drinking Evian,” informing the fan that the waters of the Nile can lead to schistosomiasis, a disease also known as snail fever, which has plagued Egypt for so long that strains have been found in excavated pharaonic-era mummies.

To clear his head during his martial-arts training in the 1950s, Bruce Lee went sailing. He slapped the water angrily and found it instructive about kung fu. “I struck it but it did not suffer hurt,” he later wrote. “I then tried to grasp a handful of it but this proved impossible.” Lee was energized. “That was it!” he recalled. “I wanted to be like the nature of water.”

“Waters from snow and ice are all bad,” opined Hippocrates of Cos around 400 BC. “Once frozen, water never recovers its original nature, but the clear, light, sweet part is separated out and disappears.” Such melted waters, he declared, “are the worst for all purposes.”

Around 14,500 years ago, at the end of the last ice age, the collapse of a large chunk of ice, likely from the Laurentide Ice Sheet covering North America, initiated an event known as Meltwater Pulse 1A. Sea levels rose more than a foot—and more than a mile of coast disappeared—per decade, displacing those living near shorelines. The earth’s human population was then roughly three million, 0.04 percent of what it is today.



THE GOD OF RUNNING WATER

by Sarah Ruden

*When the poor and needy seek water, and there is none,
and their tongue fails for thirst, I the Lord will hear
them, I the God of Israel will not forsake them. I will
open rivers in high places, and fountains in the midst of
the valleys: I will make the wilderness a pool of water,
and the dry land springs of water.*

—Book of Isaiah

Through the Jordan Rift Valley flows its river, named from the Hebrew verb for “go down.” The valley is the result of a shattering that separated the Arabian Peninsula from Africa millions of years ago, motions that riled the land aboveground and below, creating a variety of wrinkles, fissures, and bubbles, and a certain whimsicality in water supplies. A number of springs are hot and infused with minerals. Dry streambeds, called wadis, flood after storms. The foundation stories of the Hebrew Bible—by far the fullest written source about early civilization in the region—support archaeological findings in depicting a local political economy that was decentralized, partly nomadic, and based on small-scale crops and herds. This is what we would expect where water drove not accumulated power and wealth but improvisation for survival.

In contrast, abundant, readily usable running water shaped earlier civilizations of the Near East. There were dikes, canals, and sluices to keep the land on a riverbank fertile while sparing it from destructive flooding. The most valuable tracts could then be rationally apportioned, and the labor for exploiting them could be efficiently assigned. Organizing the flow above and the dirt below lifted farming above subsistence levels, which meant surplus yields to be shared with rulers or taxed and traded in regulated markets, and often transported by navigators on the river itself. Even when water was not substantially controllable, it proved to be at least understandable—and so exploitable to tremendous effect. In Egypt a calendar linked the Nile’s yearly fertilizing floods to astronomical cycles, establishing the magic of

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food production and the glories of plenty as a function of the administrative and professional classes, with the pharaohs at the apex claiming absolute rule by virtue of their ability to inter-mediate with the gods and grant or withhold water's life-giving power.

But the Jordan could not offer Canaanite farmers and herders what the Nile would have. The major river in the small polygon of the Holy Land is only about two hundred miles long and falls fast and steep over much of its length. It is more apt to erode the soil than to leave alluvial

Water is the readiest means of making friends with nature.

—Ludwig Feuerbach, 1841

riches, so some forests were allowed to remain on its banks. Its stretches of white water have always limited navigation; the outlet, anyway, is not the Mediterranean but the Dead Sea, a corrosive salt lake. Neither Jerusalem nor Samaria, the capitals of the divided kingdom known to history, was built on its banks.

Over many miles and many centuries, the only available water technology was wells, which gave rise to consequential Old Testament narratives. Take, for example, the first encounter of Jacob, the progenitor of the Twelve Tribes of Israel, with Rachel, who was to be his favorite wife and the mother of Joseph and Benjamin. Rachel (from the Hebrew word for “ewe”) is tending her flock—her lone deployment testifies to her family's poverty and vulnerability—and she depends on a crowd of male shepherds to shift the stone cover of a well; it's implied how much fun they had in their encounters with her, and how little fun she had. But now her cousin Jacob arrives from the wilderness and moves the stone single-handedly, rendering her safe and respected. Later, during the time of Roman waterworks starting in the first century BC, wells were still momentous. In the biblical book of John, Jesus is resting next to “Jacob's Well” during a journey, but it is now a Samaritan water source; he ends up having a challenging and mutually revelatory

conversation with the Samaritan woman he has asked for a drink in defiance of the religious rules that made Samaritans untouchable to Jews.

But the most celebrated water in ancient Palestine did not come from wells; it rose in the natural springs that fed enduring streams and rivers and communal reservoirs. In the Old Testament, flowing or “living” water stands for God's faithful and lasting provision for his people. From the opposite direction, from above, God's presence is announced by powerful, dramatic, life-giving storms. The spring (or fountain) and the rain surrounded the chosen people with verdure—but only, according to a biblical refrain for God's interventions, “at the right time.”

The rewards of faith unimaginably surpassed any material need. Deliverance was imagined in a climactic complex of images: pure, abundant, lifesaving water encountered amid dryness, a “grace” or free gift from a God reaching out to dying humankind, not only saving life now but lifting it on high forever. Instead of well water to be hauled laboriously out, Jesus promises the Samaritan woman water that is active on its own, literally transcendent, “springing up into everlasting life.” That is, God will come to her with salvation—if only she could be ready for it.

These ideas of peril, hope, and deliverance had geological and meteorological origins. Because large-scale irrigation works were not possible in Palestine—as they were for the Egyptians and for the Babylonians, who exploited the Tigris and Euphrates—the locals never experienced a human-engineered transformation of their lives toward collective wealth and strong government. They had water sources, including rain, whose origins—underground, in the atmosphere, in distant mountains—they couldn't see and whose intermittent failure they couldn't understand.

Contrasting experiences of water technology were rare. King Hezekiah—who, with the exception of his great-grandson Josiah, was the only great biblical king after Solomon—reportedly

channeled water into Jerusalem from a spring as a precaution against a siege by the Assyrians. The Siloam Tunnel, as it is known to archaeologists, was an ambitious and ingenious project for the time and the region, but nothing else on even that modest scale was apparently undertaken in the area until imperialist Greek builders arrived in the late fourth century BC, after the conquests of Alexander the Great in Asia and the Middle East. Then, several centuries later, these were followed by the Romans with their gigantic sewers and aqueducts.

The unpredictability of water early on must have fed into the idea of a single God who sustained his people with inexplicable love but also often became very angry. His anger, however, must be survivable; there had to be a reason that a people always vulnerable to drought and famine and foreign conquest were still there. But pessimism and irony as well as fearful reverence became inescapable for a group whose major river was good for little except as a landmark, whose biggest lake was useless for fishing or watering livestock and uninhabited on most of its shores.

Perhaps most fundamentally, this was a landscape on which to develop a fine contempt for steep human authority—not only for Nebuchadnezzar and the pharaoh, with their hubristic and brittle material power, but also for the native hierarchy, that long succession of royal courts, with their self-defeating foreign alliances and spasms of useless idolatry. Salvation was, self-evidently, not pending from formal government, not even from that of the one God's own priests and their acolytes. Instead, perhaps it would come from the Lord who dwelt on high and offered the untamed weather, which brought either sudden rescue or slow death.

Accordingly, Judaism yielded in abundance that freelance popular leader, the prophet, who communicated with God in the wilderness (the Hebrew word for which means “place of speaking”) and was a master of these mysterious places' water. The prophet had vague prototypes through the rest of the Middle East in subservient indoor officials such as the scribe, courtier,

priest, and diplomat, but Hebrew prophets could carry their power independently, in no small part because they testified to the divine liquid secrets of life and death. Moses the holy magician first punishes the Egyptians by turning the Nile into blood. He leads the Hebrew slaves out of bondage, parting the Red Sea to let them pass through and then bringing the waters back together to drown Pharaoh's pursuing army. He keeps the Hebrews alive for forty years of wandering in the wilderness; they survive on the manna (from the Aramaic for “What is it?”) that forms like

*No poems can please long, nor live, that are
written by water drinkers.*

—Horace, 35 BC

morning dew. In an emergency, he strikes a rock with his staff and water pours out.

Other examples of prophetic affinity with water abound. Elijah, at war with the wicked and worldly regime of King Ahab of Israel, flees by God's command and camps out in a ravine, near a stream he can drink from, where ravens will feed him regularly. The stream dries up during a drought that punishes Israel for the pagan worship of Baal, a purported weather god. Elijah proceeds to a pagan town and miraculously renews the grain supply of the widow who takes him in, and later he even raises her son from the dead. In a climactic confrontation with the priests of Baal, he challenges them to light by prayer alone the fire to consume a sacrifice. After hours of their useless prancing and praying and bloody self-mutilation, he soaks the altar with water and invokes an annihilating fire onto it from the sky.

Amos, a prophet who passionately opposes inequality and corruption, reports of God commanding the people to “let justice roll like waters, and righteousness like an ever-flowing stream,” in place of empty Temple ritual. His belief in God's indifference to festivals, sacrifices, and liturgical music—and his invocation of dramatically flowing water that heals social wrongs—may reflect an observation that there was no causal relationship between religious performances in

the Temple and communal well-being, whereas plentiful water could visibly restore the economy.

Early during the first century, the sort of unofficial resistant Judaism we read about in the Old Testament's books of the Prophets, with its emphasis on independent faith and moral purity—as opposed to inherited and institutional position—culminated in the cult of baptism, with John surviving on locusts and wild honey and dipping penitents in the Jordan, so that the swift-flowing water would carry their sin away to an unknown place.

In fact, all the prophets—and the stories of their persecutions back this up—had a talent for uprooting and overturning what was overgrown and ethically petrified. According to the Bible, a Canaanite-style prophet could, like Moses or Daniel or Jonah, come from a relative nowhere and confront the most powerful ruler in the world. In the face of the prophets' influence, modern secular notions of prophecy (inspired

foretelling) and the prophetic (usually of someone “speaking truth to power”) are woefully narrow. The post-Solomonic kings had nothing on prophets, many of whom were ingenious authors commanding words that flowed of their own accord. An index of the Greek New Testament reveals that, at least during the time of Jesus and in the decades after, the books of the Prophets were rampantly quoted in popular discourse—Isaiah was a particularly lively inspirer of the Jesus movement—whereas little spontaneous interest showed in the reams of biblical law (outside of the Ten Commandments) or the biblical histories of the royal houses.

Biblical law was much concerned with blood sacrifice, which from the seventh century BC was restricted to the Temple. The flow of bodily fluid there tended to be covered over with euphemism, or with sheer silence, in Jewish scripture—as were menstruation, sex, and childbirth. But the fear, the disgust, the smells,

Liquid Assets

Water laws in history

• Mesopotamia: c. 2100 BC

The earliest written law code stipulates that the water supply, including any dam or canal, is a communal asset and cannot belong to any individual. Local officials are appointed to mediate water conflicts.

Rome: c. 11 BC •

Following Augustus' reorganization of the aqueduct system, the consuls declare it illegal for residents to collect and use the overflow of public fountains without a permit; a constant flow of runoff is needed to flush the city's sewers.

India: c. 150 BC •

The Laws of Manu state that those who are able to build waterworks for others are obligated to do so; the building of villages surrounded by bodies of water is encouraged.

• Egypt: c. 1960 BC

King Sesostrius rules that farmers along the Nile are eligible for a tax cut based on how much land they lose to flooding. Measurement of flooded areas prompts the development of geometry.

Iceland: 1117 •

The Jónsbók law code states that rivers are regulated by in-stream rights: “Each man may place nets in his part of the stream, but in such a way that the fish are able to swim up into every part of the stream.”

• Mecca: c. 600

Muhammad declares that enemies' water supplies may be strategically cut off, although sharia law later states that prisoners of war cannot be deprived of water. Hoarding of surplus water is also forbidden.

• Spain: c. 120

The *Lex riui Hiberiensis*, a set of regulations governing an irrigation system along the east bank of the Ebro, decrees that canals are to be maintained by all users in proportion to the amount of water they receive.

Lombardy: 1158 •

Holy Roman Emperor Frederick I redefines the legal status of rivers: only navigable waters are now public.

the whole chaotic scene is easily inferred: in the *Aeneid*, that great Roman national epic of the classical era, a contestant in a footrace slips in a slime of cattle blood and dung from the sacrifices that have inaugurated the games.

From a hygienic angle alone, the Temple must have been a particularly glaring iteration of the ancient metropolis' broken promises. It was supposed to be safe for a people to live together within high walls. But ancient cities—even those with the most technologically advanced waterworks—were filthy, ideal for the spread of disease. The actual public cleansing facilities, such as the Roman bathhouses and the “healing” pool of Bethesda in Jerusalem, were likely rich sources of infection, offering death under the auspices of purification. It was, in fact, better to stay in the village and bathe from a basin of well water or with oil and a scraper.

Attempts to institutionalize the defiant vision of holiness and wholeness—in which hu-

mankind was washed, purified, and sanctified by God alone, absent the needs of the urban hierarchy, naturally and for no earthly price—can be traced from ascetic Jewish sectarian movements starting in the second and first centuries BC through to Christian anchoritic and monastic practices and beyond. A deep irony, of course, is that this attitude itself was a significant instigator of conflict. Dedicated idealists often cause catastrophes. No matter how nurturing, cleansing, or moralistic the vision of water as freedom and life, it is not usually water that ends up flowing from it but blood.

All this shouldn't be particularly surprising if we consider the fate of a modern world shaped by Jewish and Christian thought and practice, from which we have inherited so much contradiction: a passionate longing for an all-powerful life force that confers individual freedom and authority and yet demands emotional

• **South Africa:** c. 1652

Per the Dutch East Indies Trading Company, water belongs to the state, and water rights—revocable at any time—are granted only by the authorities.

• **France:** 1804 •

The Napoleonic Code is the first to formally indicate riparian rights: anyone who owns land bordering a body of water has a right to use it as long as the water is not diverted from other riparian landowners.

• **Melbourne:** 2007 •

Water restrictions escalate to Level 3 during a ten-year drought: car washing, filling of pools, and garden sprinklers are all banned. Residents are encouraged to place buckets under their showers to collect gray water.

• **India and Pakistan:** 1960 •

The Indus Water Treaty establishes shared rights to the rivers running from India into Pakistan.

• **Palestine:** 1858 •

The civil code of the Ottoman Empire states that groundwater is jointly owned by the public and forbids the construction of sewers close to wells and other sources of clean water.

• **Russia:** c. 1917

The Soviet government asserts that all bodies of water are exclusive property of the state.

• **Utah:** 1847 •

When disputes arise over unequal distribution of water, Mormon settlers apply the rule of prior appropriation: whoever makes first use of the water has the greatest right to it, contrary to riparian rights.

• **United States:** 1972 •

The Clean Water Act makes it illegal to “discharge any pollutant from a point source into navigable waters, unless a permit was obtained.” Pesticides are not considered point-source pollutants.



and intellectual surrender; that prescribes both sublime self-acceptance and the most excruciating self-annihilation. What more ideal imagery could exist for this ideology than the endlessness of water—what we dream of but can't have?

What we do have is unending conflict. The ancient imperial cultures kept falling into obscure local backwardness; we just keep hurtling ahead, because in the contemporary West our crises are never, in essence, about some brittle hubristic tyrant but instead about all of us and the ridiculous pretensions we can accumulate together. We are forced to acknowledge, on a much larger stage, what human beings are: creatures of

Every fool becomes a philosopher after ten days of rain.

—Clover Adams, 1882

dust and ash, who, though made mostly of water, don't flow esoterically but rather congeal in lumps under the rain. Prophets called for us to free ourselves of the tyranny of social strictures and ascend to the plane of pure thought. But what do we do once we stop slaughtering in the Temple to buy self-preservation and good fortune, and turn to some ethereal aspiration?

Augustine of Hippo tried in late antiquity to establish a contemplatively sublimated Christian community but found himself instead running a state-sponsored monastic group, preoccupied with doctrinal enforcement and real estate. Francis of Assisi—called the only man in history actually to have practiced Christianity—once forbade a follower to acquire a Psalter (a worship text based on the Psalms) because this would lead inevitably to the man's sitting on a lofty chair and ordering someone else around. But the Franciscans did eventually acquire vast libraries and archives, and they do routinely give mundane orders. The hope for watery freedom hardens on the land.

I have spent years reading these stories, and I realize now how thoroughly I have lived them. Growing up in the American heartland of the twentieth century, I found myself on an

extended, poignant prong of the West, where refugees of conscience and oppression had begun to settle a century and a half before, picturing freedom from want and fear and selfless service to the future, picturing in almost the same thought trim farmhouses and stylish buggies. My family was a fairly smooth continuation from all this. Some of our ancestors had evinced the searing antislavery sentiment typical of German settlers. We were now pious Methodists still honoring the sacrifices of the Great Depression, World War II, and the Korean War; but we were materialistic, too, and especially shamed by owning only an acre and a quarter.

This was northwest Ohio, in the region of the former Black Swamp. Recognizing the value of the black earth underneath, settlers in the late nineteenth century had drained the swamp by digging some of the most extensive ditches in the world, and these now follow a grid of neat blacktop roads bordering fields of corn, wheat, and soybeans. Though we ourselves were not farmers—my father was a biology professor at the university in town—we had fields on three sides of our house beside the Dixie Highway. A channelized stretch of the Portage River—essentially a large ditch—was a quarter mile down the highway in one direction. About a half mile to the back of us, a ditch ran under a culvert, the Troll's Bridge, so named by our rather desperate projection of folklore onto our landscape. The river and the ditches emptied so fast after heavy rains that you could seldom see any water in them, only grass on the sides and mud at the bottom.

Actual bodies of water in Wood County were quarries—thronged with swilling teenagers, a few of whom drowned—where gravel had been dug; slimy-bottomed ponds hollowed out for dirt to build highway overpasses and now infested with “swimmer's itch” parasites from waterfowl; and the shallow pond in the university's biology research and teaching woods beyond the Troll's Bridge.

I fantasized about natural water dividing the land, and I hypnotized myself into certainty that the large spring puddle in the field

behind our house was becoming a lake, fed by a waterfall from the heaping clouds that could be mountains. I anticipated the ditches overflowing into uncontrollable wetlands. I hounded my parents for visits to Lake Erie, though it was too polluted to swim in.

It was therefore thrilling that the family moved, when I was fifteen, to an apartment in the Wood County Historical Museum after my mother got a job managing the park around it. The complex comprised a sixty-room, mostly empty former poorhouse (now grandly styled a museum) and dozens of acres of gardens, forest, and fields interspersed with outbuildings. A road passed through the grounds beside disused reservoirs and through the forest, and crossed an iron bridge over a natural stretch of the Portage.

At one point during the late 1970s, farmers upstream from us sought permission to channelize the wild portions of the river. The project would make the Portage a ditch in its entirety. Amid the initial controversy, a fearsome farming mogul named Mr. Apple sent a hireling with a backhoe into the park one Sunday morning, and a stretch of one bank was churned into a massive brown batter before we knew what was happening. My parents called the sheriff and later founded Save the Old Portage, or STOP, recruiting my father's university colleagues as well as downriver farmers who would get destructive flooding instead of lucrative drainage out of the channelization.

But economics barely figured in our initial campaign. Water mad as I was myself, I was surprised at how much love running water could evoke. Even I knew that, for example, trying to canoe here was silly, but in a publicity stunt, a professor and his young family steered and hauled their vessel through several miles of the low midsummer current and declared the experience inspiring. Hardened eyes wept over a Friends of the Earth film and its musical evocation of "clear, fragrant waters that rolled in the sun." For display at the county fair, we took photos of misty and curving stretches of the Portage.

But the spirit of the wilderness—in the tradition of the biblical prophets we studied and

sang about—is tricky in public life. Of course the spirit defies Pharaoh, the tyrant; Mr. Apple, the plutocrat; and the Army Corps of Engineers, with its hunger for pork barrel. But it also struggles to deal at all productively with county commissioners and courts, with its own governing entities, close at hand and theoretically under its control in an idealized commonwealth.

This problem is particularly acute when the object of contention is water. Americans have often pictured themselves, as the Israelites did, as settlers in a providentially well-watered and fertile land meant just for them. Canaan was going to be "flowing with milk and honey" for

Spit not in the well; you may have to drink its water.

—French proverb

former slaves. North America was going to open glistening wet wildernesses to former peasants and urban throwaways. Much of precolonial North America was actually a network of beaver ponds, deep natural reservoirs that stabilized the soil and climate, and the earliest Europeans to penetrate many areas were beaver trappers.

Early explorers traveled by rivers and lakes and were awed by waterfalls. Settlements tended to run organically along waterways, which quickly came in for systematic exploitation. The Erie Canal, for instance, critically extended massive commodities trade into the West and made New York City rich. Iconic statesmen backed such "internal improvements" to facilitate sustainable commerce.

But there was also a long strain of American aspiration that had nothing to do directly with farming or trade but instead enthralled itself to the wild, tumultuous, and sprawling natural world. Such aspiration possessed Teddy Roosevelt, the first great statesman of conservation. Water in the national experience was, on the one hand, an indispensable resource for survival and development but, on the other, a symbol and the reality of decentralization, of freedom and spiritual independence.



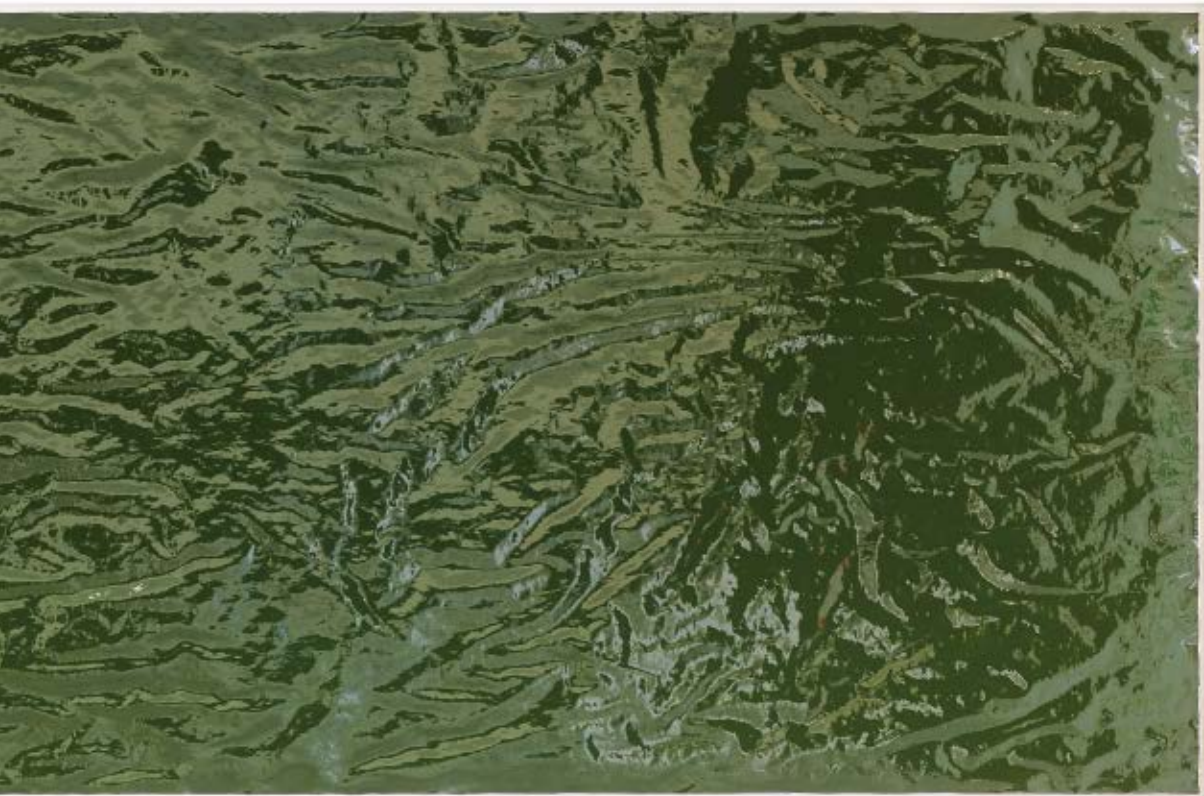
Water, by Gary Hume, 2017. Enamel paint on paper mounted in artist's frame, 46 $\frac{7}{8}$ x 141 $\frac{3}{8}$ inches.

The tension has been there from ancient times; our relationship to water has never really fit into our notion of an orderly society and body politic. In the whole of the Bible, so full of laws and strictures, I don't find a single verse instructing the people how to protect and share water. And as the prophets came up short on detailed and practical ideas for the national renewal they envisioned, so too are the U.S. laws on water inadequate, a notorious hodgepodge; in some places they include the right to draw from a watercourse as much as you like simply because your ancestor homesteaded on the banks. Even in the twenty-first century, industrialists effectively have the right to poison the drinking water of millions, knowingly and for profit. That's how little the EPA and other agencies are entitled to do in opposition, despite the Clean Water Act and other measures considered public health and conservation landmarks.

My parents and the other adults in STOP were caught in paradoxes many other water conservationists would recognize. They wanted to exercise community leadership, to affect

practical control in a cause that was fundamentally antipolitical, that argued for the sanctity of a watercourse as nature had made it: free, untouchable, and transcendent, the landscape's counterpart of the sanctified person, deeply beloved and eternally protected by God. Jesus and the prophets didn't talk about "living water" in scripture for nothing.

But a successful political process requires a very different discourse, one of public safety, public health, public resources, hard science, and the long-term economy—a language that, however useful and valid, is alien to the powerfully religious reality of my family's conservationism. I recall once piping up in a public forum that STOP had staged to tell about the river's compelling, self-sufficient beauty. I remember the alarm in my cohort, the humiliation for me, the glee for our opponents. I had hit the trip wire of idolatry, had embraced an inanimate object and claimed for it untouchable prestige. This was more offensive than the opposition's claim that this river was simply an object meant for their use or for the public good as they chose to frame it.



We eventually got with the public-policy program by not talking about water at all. As it happened, antichannelization groups in other parts of the country had found a legal work-around in the requirements of eminent domain on dry land. The timber lost because straightening, deepening, and widening a natural waterway through private land was property that had to be paid for at fair market value; a mature white oak, for instance, bought from a specialist nursery and expertly transplanted to ensure survival, cost tens of thousands of dollars: “replacement value” to be ponied up if the original tree was “taken.” We identified and measured every tree on every wild riverbank in private ownership, thousands of trees, and presented the county with the prospective bill. That got their attention; the legal settlement soon entered into saved a considerable part of the river.

Forty years after STOP, I live in a Connecticut suburb, in a house across the road from a public-water-supply reserve that comprises woods, wetlands, and a natural river

seasonally stocked with fish. Through an underground pipe that passes just beyond our property line in the back, and then under a road that runs beside our yard, rainwater flows into the reserve. It’s a much-littered, wildlife- and pet-slaughtering road populated largely with speeding, music-blaring undergraduates who live and party in neighborhood rentals. I dislike the road, but when I walk the dog by it, I often hear a lively and peaceful rush underneath.

This sound doesn’t relieve me—of course, nothing does—of the vertigo of mystical monotheism, and individualism, and progressivism, and New Age spirituality, and every other hotdogging hunch since that original one in the semidesert: that we somehow will survive both emotionally and physically, that enough water both to revere and use will magically continue appearing.

But the cheerful rushing sound doesn’t preclude—and in fact includes—the warning of an apocalyptic reckoning. Life around us will one day be unrecognizable, if it endures at all; everything might soon be utterly different.

GLOSSARY

acre-foot: The amount of water that is needed to cover an acre of land one foot deep (approximately 326,000 gallons).

aggressive water: Water that is soft and acidic; such water quickly erodes plumbing.

antediluvian: Of or relating to the period before the flood described in Genesis. Also, antiquated, ridiculously old-fashioned, or out-of-date.

antifogmatic: An alcoholic liquor taken to counteract the effects of damp or wet.

aqilokoq: Inuit for “softly falling snow.” Contrary to earlier studies, the Inuit dialect spoken in Canada’s Nunavik region does have at least 53 words for snow.

artesian well: A well bored perpendicularly into water-bearing strata; natural pressure provides constant water with little or no pumping. From French *artésien*, of or relating to the province of Artois, where the technique originated.

backswimmer: Any of a group of insects of the family Notonectidae that are found worldwide and are named for their ability to swim on their backs.

baptism: Derived from Greek verb *βάπτω*, dip, which in turn may be traced to reconstructed Indo-European *gabb-*, dip.

bathroom: A room containing a toilet or toilets, usually with facilities for hand washing, and sometimes also a bath or shower. Orig. and chiefly N. Amer. First used as a euphemism for *toilet*, 1883.

blackwater: Water containing waste from humans, animals, or food.

carafe: A glass water bottle for the table, bedroom, etc. From French *carafe*, Italian *caraffa*, Sicilian *car-rabba*. According to Émile Littré, it was identified by Julius von Mohl with Persian *qarābah*, a flagon, but Reinhart Dozy refers it to Arabic *gharafa*, to draw or lift water.

cha shui biao: 查水表 Chinese for “check water meter.” Used in response to possibly subversive comments, suggesting that police or other authorities will arrest the commenter under the guise of inspecting a water meter.

dive: (*v.*) Of a submarine, to submerge. “Its speed was lessened: sometimes it kept on the surface, sometimes it dived to avoid a vessel.”—Jules Verne, *20,000 Leagues Under the Sea* (1870). Modern past-tense form *dove* (1855) is apparently a new formation after *drove*, *wove*, etc.

eau de cologne: A citrus perfume originally mixed in Cologne by Giovanni Maria Farina in 1709.

firn: Old snow that has become granular and dense under the ac-

tion of various processes of melting and refreezing, including sublimation and crystallization.

fog: A thick, obscuring mist. Origin obscure, possibly from Danish *fog*, spray, shower, or Old Norse *fiuk*, drifting snowstorm. Compare Old English *fuht*, German *Feucht*, damp, moist.

gletscher: A glacier. From German *gletscher*, adopted in 16th cent. from Swiss dialect for French *glacier*.

hogwash: (*depreciative*) A liquid for drinking that is of poor quality; also, nonsense, esp. worthless, ridiculous, or nonsensical ideas. “Your butler purloins your liquor, and your brewer sells you hogwash.”—John Arbutnot, 1712

human wave: A wavelike effect produced in a stadium by successive sections of the crowd of spectators standing up, raising arms, and sitting down again. This form of crowd participation became popular among spectators at World Cup matches in Mexico City in 1986, thus also *Mexican wave*.

hydropot: A water drinker; one who abstains from alcohol. From Greek *ὕδροποτης*, water drinker; in French, *hydropote*.

iceblink: “A name given by seamen to a bright appearance near the horizon, occasioned by the ice, and observed before the ice itself is seen.”—Webster’s *American Dict. of the English Language* (1828)

knucker: In Sussex, a water dragon. From Old English *nicor*, water monster.

leaker: One who discloses secret information. First use, 1969.

levee: An embankment to prevent the overflow of a river. From French *levée*, feminine of *levé*, past participle of *lever*, to raise.



kappa

河童 Japanese for “river child.” A *yokai* demon, a vampirelike lecherous creature in Japanese folklore. The size of a child, it is yellow-green in color and resembles a monkey but with scales rather than skin. Kappa legends are said to be based on the Japanese giant salamander (*Andrias japonicus*), a large amphibian.

liquidity: (*Obs.*) Rarefied condition, subtlety. Also, the quality of being financially liquid (1879).

maximum contaminant level: The highest level of a contaminant permitted in drinking water.

mist: A cloud of vapor. In meteorology, mist is distinguished from fog as being less opaque, with visibility of at least one kilometer, and from haze, which is due to solid particles, not water droplets. Inherited from Germanic; extended form of the Indo-European base of Sanskrit *mih*, mist, vapor, *megha*, cloud; Greek *μίχλη*, mist, cloud.

Neopluvial: A phase of the late Holocene epoch of wetter and colder climate in the American West.

overdraft: An extraction of groundwater at a rate so in excess of replenishment that groundwater levels decline persistently.

pool party: First use, 1913. Described in the *New York Times* as “a new wrinkle in entertainment.”

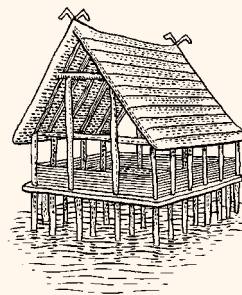
POPs: Persistent organic pollutants, compounds not easily biodegraded.

puddle: A pool of standing water. Origin uncertain, probably related to Middle Dutch *podel*, *poedel*, in the compound *podelpoel*, mud pool, and perhaps also in the place-names Pudelwiic, Poedelwiike, after a district in Holland. Compare also German regional *Pfudel*, *Pudel*, pool, puddle.

Pfahlbaufieber

German for “pile-dwelling fever.”

The 1853 discovery of Neolithic pile-dwelling settlements in Lake Zürich set off a rush for lacustrine antiquities. Some loot went to private collectors; one Swiss doctor held 8,227 artifacts. American museums—Field, Milwaukee Public, and Peabody among them—also profited. Pfahlbau culture had survived for 3,500 years. The last evidence of it comes from the seventh century BC.



rainmaker: A person who generates income for a company or an organization, esp. by attracting clients. First use, 1897.

seltzer: An effervescent mineral water obtained near Nieder-Selters containing sodium chloride as well as sodium, calcium, and magnesium carbonates. Also, an artificial mineral water of similar composition. From German *Selterser*, *Selters*, the name of a village in Hesse. Compare French *seltz*, *selz*.

slur: A thin or fluid mud. Of obscure origin; compare Dutch *sloor*, *sloerie*, Middle Dutch *slore*, a slut-tish woman.

slush: A watery substance resulting from partial melting of snow or ice. Of obscure origin; the word's late appearance makes it doubtful there is a connection with such forms as older Danish *slus*, sleet, mud, or Norwegian *slusk*, slops, muddy ground, or weather.

snow job: Deception, insincere charm.

sold down the river: To be betrayed or cheated. From Ohio River and Mississippi River slave trade; slaves were shipped south, where conditions were more brutal. Between 1850 and 1860, 193,000 slaves were transported across state lines.

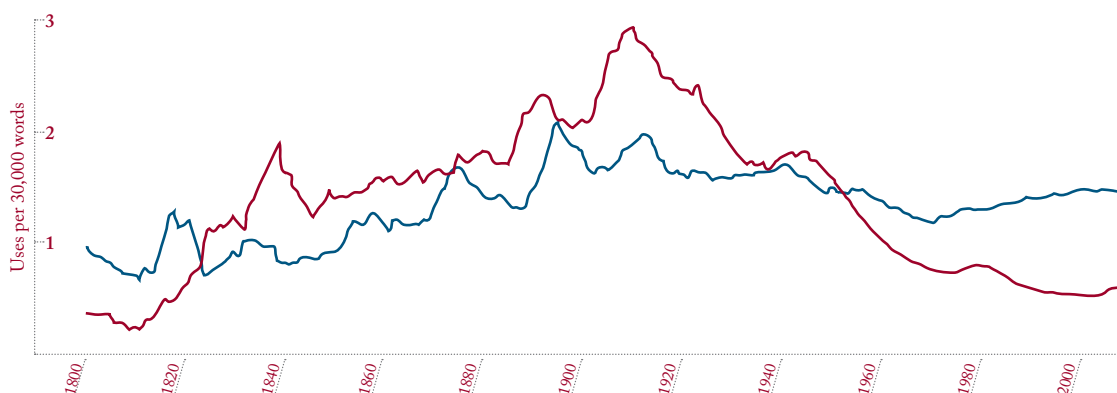
swim: (*v.*) To conform to prison society.

virgula divina: (*Obs.*) A dowsing rod; a forked stick (typically of hazelwood) used to discover groundwater.

vodyanoy: In Slavic mythology, a male water goblin. From Russian водяной, watery. Local drownings are considered to be the work of the vodyanoy, which lures unwary humans to their death in the water.

water birth: The act of defecating in a swimming pool.

ice and steam



Based on Google Ngram Viewer. Use of the words ice and steam between 1800 and 2008, from a database of more than 5 million books.

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*The waters are nature's storehouse, in which she locks
up her wonders.*

—Izaak Walton, 1653

Ramona Falls, Oregon, by Stu Levy, 1982.



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